Metals Review

THE NEWS DIGEST MAGAZINE

Volume XXII, No. 2 FEATURING: THE LESS COMMON METALS February 1949

Metals Review

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RAY T. BAYLESS, Publishing Director | MARJORIE R. HYSLOP, Editor | GEORGE H. LOUGHNER, Production Manager

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A.S.M. REVIEW OF METAL LITERATURE

FEATURE ARTICLE

IMPORTANT LECTURES

DEPARTMENTS

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Quiz You Is . . . or Quiz You Ain't . . .

A METALS MENTAL GIANT?

Your name will be printed in Metals Review's Honor Roll of the well-informed . . . . if . . . .

YOU SIMPLY CHECK THE CORRECT ANSWERS TO THE TEN QUESTIONS LISTED BELOW . . . .

To make this quick test of your knowledge of metals, of events and developments in your industry, just follow these three steps: 1. Read each question and mark the answer you believe to be correct. 2. Then look over this issue of *Metals Review* and indicate where the answer is found. 3. Then fill in your name, title and company connection, tear out and mail. That's all. See if you're a metals mental giant. If your answers are correct, your name will appear in *Metals Review's* Honor Roll of the Well-Informed in April.

1. Iron percarbide is:
   (a) A new reagent used in the chemical analysis of aluminum and magnesium alloys.
   (b) A new tool material developed to retain strength and corrosion resistance at high temperatures.
   (c) A phase in the iron-carbon system with the empirical formula $Fe_{20}C_9$.
   Answer found on page ——; item no. ——

2. Pickling inhibitors in general have the following effect on hydrogen embrittlement:
   (a) Increase embrittlement both in mild and in stainless steel.
   (b) Inhibit embrittlement of mild steel but not of stainless.
   (c) Inhibit embrittlement of stainless but not mild steel.
   Answer found on page ——; item no. ——

3. Distinguishing feature of a time-saving combustion technique for steel analysis is:
   (a) That an electric furnace heated with metallic resistors is used.
   (b) That ten samples can be analyzed at one time.
   (c) That a higher test temperature is used.
   (d) That accuracy is increased to the third decimal place.
   Answer found on page ——; item no. ——

4. A combination of tungsten carbide equipment, an induction furnace and silicone die lubricants is used to make the following product:
   (a) Bronze wire made from centrifugally cast plate.
   (b) Steel die castings.
   (c) Hot formed magnesium sheet.
   (d) Hot forged high-alloy turbine blades.
   Answer found on page ——; item no. ——

5. A modification of the wax and plaster process for casting aluminum uses the following as basic raw material for the mold, mixed with various other ingredients.
   (a) Sand
   (b) Asbestos
   (c) Gypsum
   (d) Talc
   Answer found on page ——; item no. ——

6. Aluminum-silicon alloys are notable primarily for:
   (a) High strength
   (b) Good foundry characteristics
   (c) Machinability
   (d) Ductility
   Answer found on page ——.

7. An important advantage of megacycle induction heating is:
   (a) That the coil need not conform to the contour of the workpiece
   (b) That it gives deep penetration of heat.
   (c) That alloys can be melted in an extremely short period of time.
   Answer found on page ——.

8. Among the many attractive properties of titanium metal is the following:
   (a) Extreme lightness
   (b) Electrical properties
   (c) Stability in the presence of oxygen and nitrogen
   (d) Corrosion resistance
   Answer found on page ——.

9. A new series of "Techbooks" initiated by the American Society for Metals is designed for the following purpose:
   (a) Self-education
   (b) College texts
   (c) Shop instruction manuals
   Answer found on page ——.

10. Precision machined parts can be cleaned and held within tolerances as close as 0.0001 in. by a process known as:
    (a) Troxide
    (b) Dip-agitating
    (c) Turbulator
    (d) Hydro-Finish
    Answer found on page ——.

NAME . . . . TITLE . . . .

COMPANY . . . . ASM CHAPTER . . . .

MAIL TO METALS REVIEW, 7301 EUCLID AVE., CLEVELAND 3, OHIO

Metallurgy and Utility of the Less Common Metals

Recent Developments Have Taken Many of Them Out of the Rare Metal Class

A Literature Survey, by D. J. Maykuth

EXAMINATION of the current status of the less common metals justifies the conclusion that certain metals heretofore considered as "rare metals" should no longer be so classified.

Titanium

Titanium serves as one outstanding example of the metals which are about to graduate from this class. It has long been known that titanium, which stands eighth in relative abundance among metals in the earth's crust, exists in high-grade deposits on this continent.

In the past, difficulties involved in the preparation of the pure metal have precluded its commercial applications. Yet as a metal, titanium exhibits several attractive properties which would place it, industrially, between the light metals, aluminum and magnesium, and the heavier metals such as iron and copper. It has an intermediate density of 4.5, possesses good strength properties, and can withstand drastic amounts of cold working. It also has a high degree of corrosion resistance, actually comparable to the common stainless steels. Titanium is, however, extremely sensitive to any traces of impurities and is particularly affected by very small percentages of oxygen and nitrogen, both of which are absorbed irreversibly at elevated temperatures and render the metal brittle.

Battelle Memorial Institute has recently reported the properties of titanium as prepared by the de Boer process (2c-35, Aug. 1948)*. Rods of about 99.9% pure material were obtained with as-deposited hardnesses varying between Vickers 60 and 120. Such material exhibited good physical and mechanical properties. The strengths observed were lower than values obtained for titanium as prepared by other processes, and the greater ductility associated with these strengths furnished an indication of the quality of the iodide product. The material had work-strengthening characteristics intermediate to those for nickel and copper.

The feasibility of preparing ductile titanium on a commercial basis was first demonstrated by the Bureau of Mines (2-322, 1947). A batch process was developed for obtaining 100-lb. lots of titanium powder by the magnesium reduction of the tetrachloride. Sound metal was obtained by cold working the vacuum-sintered powder compacts through several reduction stages with intermediate vacuum annealings. The sintered compacts could be fabricated by hot rolling, using a protective steel sheath.

Annealed titanium sheet prepared by this process showed a yield strength (0.2% offset) of 62,800 psi. and an ultimate tensile strength of 78,700 psi., with an elongation of 25%.

Additional work by these investigators shows that titanium can be cladded on molybdenum, tungsten, and steel by hot rolling sheets of the respective metals in protective steel sheaths (5-86, 1947). Where cladding is desirable, the "canned" material is rolled at appreciably higher temperatures than those which are used for the hot fabrication of titanium.

Of significant interest is the recent announcement that titanium of 99.5% purity is now available, commercially, from E. I. du Pont de Nemours & Co., both in sponge form or in ingots up to 100 lb. Literature available on the fabricated commercial product shows that its ductility and tensile properties at normal temperature are similar to the values attained in the Bureau of Mines product.

Other data on the commercial product reveal interesting information on the temperature-strength properties of titanium. Short-time temperature tests on annealed sheet show the tensile strength to decrease, gradually, from 80,000 psi. at room temperature to 36,000 psi. at 800° F. Creep rate is negligible both at 400° F. for 100 hr. at 50,000 psi. and also at 600° F. for 100 hr. at 20,000 psi. Titanium, therefore, would appear to offer considerably better creep properties than most aluminum alloys.

Titanium fabricated from the commercial product is readily forgeable at temperatures from 1600 to 1800° F. and can be satisfactorily process annealed by heating in air at 1200° F. for 1 hr.

Zirconium

Zirconium has often been spoken of as a sister metal to titanium because of their similarity in physical, chemical, and metallurgical behavior. Though of a slightly higher density than titanium, zirconium, when pure, exhibits a similar capacity for cold work, and strengths are of the same order (3-167, 1947). Zirconium is also susceptible to embrittlement by oxygen and nitrogen absorption and is believed to surpass titanium in its gettering ability.

The ductile metal may be prepared by the same general processes as titanium. The Bureau of Mines has reported that in using the method of magnesium reduction of the tetrachloride, an improved product may be obtained by employing a vacuum operation in conjunction with the final leaching operation (2-263, 1947). These authors also describe the successful melting of zirconium using graphite crucibles, both in a high-frequency vacuum furnace and a carbon-resistor vacuum furnace. The carbon pickup by zirconium so melted averaged 0.23%; this amount did not prove severely deleterious to the ductility of the ingot. The use of similar equipment to melt titanium and thorium was suggested.

At present, zirconium of very high purity made by the de Boer process is available commercially in rod, sheet, and wire form, from the Foote Mineral Co.

Molybdenum

The ready availability of molybdenum ores and the vast wartime demand for the metal have resulted in several improved manufacturing techniques and developments within the past few years. Though earlier uses of molybdenum were largely in electronic devices, its attractive properties as a structural material, particularly at elevated temperatures, have served as the basis for much current interest and research.

Successful vacuum melting of molybdenum to produce a ductile material was reported by Parke and Bens (2-22, 1947). Castings up to

*Literature references are cited by the corresponding item number in the Review of Current Metal Literature instead of repeating the entire title, author, and source; this information can be obtained by referring to *Metals Review* for the month indicated, or the 1947 bound volume of the A.S.M. Review of Metal Literature (Volume 4).

25 lb. were produced by feeding consumable electrodes to an arc struck against a water-cooled copper mold in a vacuum furnace. In these experiments, calculations indicated that an oxygen pickup of 0.0025% was sufficient to render the cast molybdenum unforgeable. Hence, it was necessary to deoxidize the ingots by carbon additions of 0.01%. More recent announcements cite the availability of castings up to 100 lb. in size.

On a volume basis, however, molybdenum as produced by powder metallurgy techniques is still largely the mainstay of supply. The manufacturing procedure entails the pressing of powder compacts which are then sintered electrically in a hydrogen atmosphere. The sintered compact is hot worked, starting at temperatures around 2200° F., through progressively lower temperatures, until the original equiaxed grain structure has been broken down into a fibrous structure.

Ingots up to 250 lb. have been produced in this manner (25-137, 1947). Molybdenum is also available in a variety of shapes, including wire, sheet, rods, cylinders, tubes, and disks.

One of the more striking physical properties of molybdenum is its high modulus of elasticity—42,000,000 psi. In this value it is exceeded only by tungsten. Sheet fabricated by the procedure outlined above is quite ductile and may be spun and formed in thicknesses up to 0.032 in. The tensile strength of the sheet stock is 70,000 psi., and this may be doubled by cold working operations. Short-time high-temperature tests on such wrought sheet show the ultimate strength at 1650° F. to be 94,000 psi.

Though its corrosion resistance at normal temperatures is good, molybdenum must be kept in protective atmospheres at temperatures greater than 750° F., because of the tendency of this metal to form its volatile oxide. In this connection, suitable cladding materials for protecting molybdenum are of interest. Several ceramic-type coatings have been found which greatly retard the oxidation of molybdenum under highly oxidizing and severe test conditions (7c-30, Aug. 1948).

While normal electrodeposition of molybdenum has not been successful, several of its compounds have been prepared by fused-electrolyte methods (2c-44, Oct. 1948). Other workers have shown that molybdenum can be plated by the thermal decomposition of its hexacarbonyls (7-391, 1947). Alloy platings of molybdenum are also possible by this process.

Tungsten

Tungsten has long been known as the "most refractory" metal. Its properties have been studied over a wide range of temperature, and its use at higher temperatures is constantly being extended.

Vacuum techniques for the melting of tungsten have been discussed (2a-5, April 1948) but little information on a successful casting process has been reported.

Because of its high melting point, commercial preparation of the metal has largely been restricted to the powder metallurgical techniques also used for molybdenum. High-purity powder is pressed into compacts and electrically sintered in a hydrogen atmosphere, after which the metal is rendered ductile by hot working at successively lower temperatures.

As with molybdenum, the cold ductility of tungsten is contingent upon the fibrous structure developed by the hot working of the sintered compacts. The metal fabricated in this manner exhibits excellent physical properties. Wires formed from hot-swaged ingots and finished by cold drawing have reached strengths in excess of 400,000 psi. (25-137, 1947). Short-time tensile tests on drawn wire at 1650° F. gave an ultimate tensile strength of 85,000 psi. Tungsten is also known to possess the highest modulus of elasticity of any metal, this property reaching a value of 53,000,000 psi.

Despite these attractive qualifications for tungsten as a structural material, its high density, comparative difficulty of fabrication, and restricted supply have somewhat limited its commercial application. Its chief use has been in the electronics industry, where its combination of refractory properties coupled with its good electrical conductivity have made it a valuable engineering material.

An appreciable amount of work has been directed toward methods for plating of tungsten. High-purity tungsten and a few of its alloys have been plated by thermal-decomposition methods (7a-25, Feb. 1948) and many workers have reported satisfactory electrodeposition of several tungsten alloys (8-107, June 1948; 8-183, Sept. 1948).

Tantalum

Although tantalum has long been in use as an engineering metal, the critical need which developed for it during the war has fostered several important technological advances.

As with the other refractory metals, tantalum is sensitive to impurities and is most conveniently prepared by powder metallurgical processes. A high grade of powdered metal is obtained by a fusion electrolysis method and this powder is then pressed into compacts. Since the prolific gettering ability of tantalum prohibits heating of the metal in air, sintering of the compacts is done electrically in a vacuum. Compacts so produced are quite ductile and may be worked cold to produce sound ingots. The commercial product has a purity of 99.9% and is available in sheet, rod, and wire form.

Annealed tantalum sheet has a 50,000-psi. tensile strength which can be increased to 170,000 psi. by cold rolling (3-346, 1947). The sheet work-hardens slowly and may be deep drawn or spun. However, the necessity of a vacuum for annealing operations introduces some difficulties where extreme working of the metal is attempted. With a protective atmosphere, tantalum may be brazed or arc welded. It can also be joined by resistance welding, spot welding, and seam welding.

Tantalum offers approximately the same resistance to chemical attack as glass. This degree of resistance, plus the associated strength, has led to its adoption in the manufacture of certain types of chemical processing equipment. Of related interest is a method for preparing tantalum coatings on various metal and ceramic bases (7c-21, Aug. 1948). Through the hydrogen reduction of its pentachloride, ductile, adherent, nonporous coatings of tantalum have been applied successfully to a variety of base materials.

The plating of tantalum by electrolytic methods has not met with success because this metal forms a self-healing oxide film which conducts current only when serving as a cathode. Commercially, this property of tantalum has been exploited for its use in wet rectifiers and lightning arrestors.

Columbium

Columbium bears as close a kinship of properties to tantalum as zirconium bears to titanium. The most striking difference between the two metals is in their densities; columbium, with a density of 8.57, has just about half the mass of tantalum. While columbium exhibits a slightly higher electrical conductivity than tantalum, its vapor pressure is higher and tantalum has generally been preferred to columbium in those electronic applications where incandescent heating of elements is necessary (26c-9, May 1948). Commercially, columbium is prepared by the same methods used for tantalum.

Both metals have been found to be "biologically acceptable", that is, contact of the metals with living tissue over extended periods of time produces no harmful or irritating effects. Hence, their use in surgical repairing operations offers a significant economic advantage over the more precious metals previously used.

Uranium

As history has shown, tremendous energy can be released by nuclear fission chain reactions in several metallic elements. Several recent reports

of the Atomic Energy Commission reveal, for the first time, some of the metallurgical developments attained in the program (25a-34, June 1948; 3c-47, Aug. 1948).

Uranium of high purity and sufficient quantity was one of the immediate goals set forth in the early stages of this work. Investigators had already shown that a good quality product of this metal can be obtained by either of two methods: (*a*) the reduction of uranium oxide or the fluoride by high purity calcium; and (*b*) the electrolyzing of potassium-uranium fluoride in a fused mixture of sodium chloride and calcium chloride.

Since calcium of the quality required was not commercially available at the time, expediency required the preparation of the metal by the second method, known as the Driggs-Lilliendahl process. A satisfactory pellet product of 99.9% purity could be made by this process, with several modifications in procedures.

Uranium so prepared has a steel-like appearance. It oxidizes slowly in air, acquiring a brown surface tarnish in a few days. Because of its reactivity with the atmosphere, hot processing of the metal involves either special atmospheres or protective sheathings, both devices having been used with success. Vacuum equipment has been found necessary for melting uranium, and ingots up to 215 lb. have been cast in that way.

Three allotropic modifications are known to exist in the pure metal. These, with their temperature ranges and general properties are as follows:

Alpha—up to 665° C.; orthorhombic unit cell; ductile.

Beta—up to 775° C.; complex cubic unit cell; brittle.

Gamma—up to 1130° C. (m. p.); body-centered cubic unit cell; soft and weak.

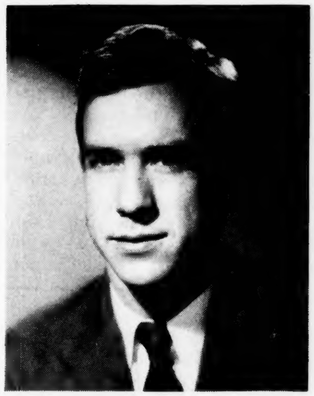
The gamma modification of uranium may become stabilized to room temperatures through additions of such body-centered cubic metals as molybdenum.

Although uranium, as cast, exhibits an inherently coarse-grained structure, it may be readily cold worked. Workhardening occurs rapidly and 50% of the maximum hardness is reached in the initial 10% reduction. Softening and subsequent recrystallization occur upon annealing the worked sheet to temperatures within the alpha range. Yield strength, by the 0.2% offset method, is 10,000 psi. for the annealed metal. This value may be increased to 70,000 psi. by cold working. Ultimate strengths as high as 200,000 psi. have been reported for some uranium alloys.

Thorium

Thorium is a second raw material which is of interest from the standpoint of energy released by nuclear fission. Because of its similarity in properties to uranium the same methods can be used for its preparation (1-18, 1947). When fresh surfaces of thorium are exposed to the atmosphere, it oxidizes readily to form a film which prevents further attack.

The casting and handling problems are essentially the same as for uranium and are similarly treated. Pure, annealed thorium metal at room temperature exhibits a face-centered cubic lattice and has a hardness of Vickers 100. It may be cold rolled into wire or sheet or cold swaged. It is not, however, readily adaptable to cold drawing because of its low tensile strength.



Daniel J. Maykuth
Engineer in Nonferrous Metallurgy Research
Battelle Memorial Institute

Beryllium

The metallurgy of beryllium, a metal long familiar for its role in the age hardening of copper alloys, was also furthered by the research work of the Atomic Energy Commission (25a-34, June 1948). Interest in this metal was manifested by this group because of its potentialities as an absorber for the capture of electrons.

As is generally known, beryllium is a silvery-white metal which possesses the very low density of 1.8. Although its density and corrosion resistance, under ordinary atmospheres, present attractive possibilities, its extreme brittleness, even as a high-purity material, has thus far precluded its use as a structural metal or even as a major alloying ingredient (23c-39, July 1948). Commercially, the metal is prepared by the fused electrolysis of its oxyfluoride. It is also available as a copper-beryllium master alloy.

Although beryllium possesses a high melting point and is extremely reactive at elevated temperatures, high-purity ingots have been cast (3c-47, Aug. 1948). Test samples of the cast material exhibited a tensile strength of 27,000 psi., an elongation of 0.0%, and a modulus of elasticity of 42,000,000 psi.

At temperatures around 750° C., beryllium may be plastically deformed and with suitable protection it may be rolled, swaged, or extruded into flats, rods, and tubes. The properties of the extruded metal were found to be slightly better than for the cast material. Tensile strengths of 40,000 to 50,000 psi. are reported with elongations up to 2%. It has been suggested that these improved properties are due to the high degree of preferred orientation which results from such hot working (4d-37, Nov. 1948).

Radioactive Tracers

The advent of the nuclear physicist has also seen the creation of a new research tool of interest to metallurgy in the form of radioactive tracer elements.

"Carbon 14" has found application in the study of flotation reactions (1a-28, Oct. 1948), and the use of tracers in a large-scale investigation of the sources of sulphur entering steel has also been reported (2b-78, June 1948).

While these methods of investigation have not yet found widespread application, increasing numbers of radioactive isotopes are becoming available. There is a growing interest in the topic and much information concerning the fundamental principles involved has been published (26a-34, May 1948; 11-210, Oct. 1948).

Other Metals

Certain others of the less common metals have found new applications within recent years largely as a result of intensive research in alloy improvement programs.

Indium is one such metal. It is silver-white in appearance, and is characterized by its extreme softness (Brinell 1) and malleability. It is stable in air and, when buffed, retains a highly reflective surface.

The principal application of indium is in bearing materials where high stresses are encountered (3c-44, Aug. 1948). A layer of indium is provided on nonferrous base metals by electrodeposition. This is followed by a diffusion heat treatment. Such indium-plated lead bearings have successfully withstood bearing pressures exceeding 10,000 psi.

Germanium, though scarcer than uranium or thorium, has continued to find new industrial use. Commercially, the metal is produced by a series of chemical purification treatments of metallurgical residues which serve as its principal sources of supply (25-38, 1947). High-quality germanium oxide is formed, and from this the pure metal is obtained by hydrogen reduction.

Pure germanium possesses several unique electrical properties that have

been exploited in the electronics field. Its behavior as a semiconductor of electricity has made it useful in certain types of high-resistance resistors. The rectifying characteristics of germanium have been recognized and were probably first practically utilized in radar microwave rectification. The subsequent development of the germanium diode, an extraordinarily simple and compact device, has permitted the construction of equally compact radios, literally of the "wrist watch" type, having no glass tubes in them. Germanium is also used in television screens because of its photo-electrical sensitivity.

An improved method for the preparation of lithium may point toward future developments in the use of this metal (2-133, 1947). Kroll and Schlecten report the preparation of lithium of 99.9% purity from mixtures of lithium oxide and calcium oxide, using silicon as a reducing agent. Aluminum is also satisfactory as a reducing agent, and the high efficiencies obtained in these vacuum reactions may be duplicated in commercial adaptations of the process. Present commercial methods for the production of lithium utilize the fusion electrolysis of a lithium chloride and potassium chloride mixture.

While lithium, with a specific gravity of 0.53, is the lightest of all solid bodies, it has found little use as a base structural metal because of its very high chemical activity.

Asarco Continuous Casting Produces Defect-Free Parts

Reported by A. Lesnewich
Rensselaer Polytechnic Institute

Machining of several million pounds of bronzes cast continuously by the Asarco process resulted in a rejection rate for casting defects of less than 0.1%, John L. Kimberley of the American Smelting and Refining Co. told the Eastern New York Chapter A.S.M. on Dec. 14.

In one of the most interesting and well-received talks of the current lecture series, Mr. Kimberley described the equipment and techniques which are used for continuous casting of tubing and special shapes such as squares, rectangles and hexagons. They may be in either solid or tubular form in sections ranging from 0.14 to 16 sq. in.

Molten metal is furnished by Detroit electric arc furnaces to a casting furnace equipped with a large crucible of sufficient size to accommodate variations in supply. Baffles in the furnace force the metal into a tortuous path to insure deoxidation and degasification and to cushion the die chamber from sloshing effects during pouring. Metal enters the die chamber through one or more drilled connecting passages and flows to the die by gravity. Upon reaching the water-cooled mold, rapid solidification occurs and the casting proceeds through a roll drive governing the speed of withdrawal to a saw which cuts it to the desired length.

Mr. Kimberley emphasized that the molds (dies) are machined from high-density graphite and are used but once. Graphite is used because its thermal conductivity is high; it is neither attacked nor wet by molten copper-base alloys, it has excellent resistance to thermal check, is self-lubricating when used as a die, and possesses outstanding machinability.

With the entire bath as a riser, Mr. Kimberley explained, feeding is so effective that no evidences of shrinkage have ever been found in the products. The conditions of high chill produce a fine, uniform dispersion of secondary constituents and complete freedom from segregation. The unusual soundness and uniformity of the continuously cast stock produces a material superior to sand or permanent mold castings in tensile and impact strength, fatigue properties and hardness.

In his coffee talk, Arthur Stuart, chief engineer of Radio Station WFLY, explained to the members and guests why FM is here to stay.

Describes Versatility of Al Bronzes

In the Photograph Taken at the November Meeting of the Calumet Chapter Are (Left to Right): James F. McQuillan, Technical Chairman; Harry P. Croft of Wheeling Bronze Casting Co., Principal Speaker; P. H. Parker, Chapter Chairman; and A. J. Scheid, Program Chairman

Reported by R. J. McQuillan
Superintendent of Whiting Plant
Federated Metals Div., A. S. & R. Co.

The various methods of casting, working and application of brass and bronze alloys were treated by Harry P. Croft, A.S.M. national trustee and vice-president in charge of development of the Wheeling Bronze Casting Co., speaking before the Calumet Chapter. The occasion was National Officers' Night on Nov. 9.

The alloys of copper, aluminum and iron (the aluminum bronzes) are particularly noteworthy because of their high resistance to wear, impact and corrosion. The range of properties afforded by regulating the alloy constituents (with the addition of nickel in some instances for increased corrosion resistance) covers a wide field of applications.

Steel pickling equipment, including hooks and baskets, is almost exclusively cast from aluminum bronze because of its high resistance to corrosion by acid. An example of the variety of properties obtainable is the slide bearings for the universal joints of steel mill rolls; the alloy is cast with properties intentionally somewhat less than ultimate so that the bearings will wear prior to the roll shaft. Thus, simple maintenance and economies are provided by replacing the bearing instead of renewing the shaft.

Dr. Croft also exhibited slide pictures of sand, centrifugal and refractory cast products. Soundness and uniformity were evidenced in the last two methods as compared with conventional foundry practice, along with substantial reductions in machining costs.

After a discussion of the thermal and electrical conductivity of a series of copper-base alloys, a question and answer session was conducted.

Presents Data on Distortion

Reported by Robert S. Morrow
Toolsteel Representative
George F. Blake, Inc.

The Dec. 8th meeting of the Worcester Chapter A.S.M. was held at Worcester Polytechnic Institute with 150 members and guests in attendance. J. Y. Riedel, toolsteel engineer of the Bethlehem Steel Co., spoke on "The Selection of Toolsteels With Relation to Heat Treatment and Distortion".

Mr. Riedel's revelation of previously unpublished data on distortion was of extreme interest to all. Chairman Leo P. Tarasov presided.

Brazed Vs. Mechanical Attachment of Carbide Tools Favors Latter

Reported by Harry A. Johnson
Gear Engineer,
Aircooled Motors, Inc.

Over a period of ten years 5300 separate experiments have been made in the development of the various grades of cemented hard carbide compositions produced by Kennametal, Inc., according to Philip M. McKenna, president of the firm. Mr. McKenna addressed the Syracuse Chapter A.S.M. on Dec. 7, at a meeting designated as "New Process Gear Corp. Night".

The methods used in producing extremely hard carbides (on the order of 91 and over on the Rockwell A scale) were described and illustrated by slides. Formation by sintering, fabrication into cutting tools, and various designs of cutting tools were also described.

Young's moduli for the Kennametal grades are considerably higher than for steel, Mr. McKenna pointed out. For this reason a light section of Kennametal cannot be properly supported on a steel backing. Use of brazed construction in carbide tools is limited to those in which strains can be successfully minimized by use of short, sturdy blanks and by proper proportioning of steel to carbide so that sections do not warp severely. Use of ductile brazing layers was discussed.

Tools designed to have the hard carbide tool blanks attached by mechanical means instead of brazing have much greater scope. Several designs of tools were illustrated in which the sintered material was clamped or bolted to the toolholders. One method is to form the material into a hollow disk and to attach to the toolholder by means of a bolt through the center. Tools of this type are being used for turning rolls at a hardness of Rockwell C-60.

Just prior to Mr. McKenna's talk and in lieu of a coffee speaker, the film "Bubble Model of a Metal" was shown, an excellent educational picture.

Metallizing Contractors Meet

The annual meeting of the American Metallizing Contractors Association was held at Tulsa, Okla., on Dec. 2, 3 and 4. Newly elected officers are Peter G. Dennison, president; Knowles B. Smith, vice-president; Walter B. Meyer, re-elected as secretary-treasurer.

Mr. Dennison is president and founder of the Metal Spraying Corp., Milwaukee; Mr. Smith is vice-president and general manager of the Dix Engineering Co., Lincoln Park, Mich.; and Mr. Meyer is manager of the metallizing division of the John Nooter Boiler Works Co., St. Louis, Missouri.

The Reviewing Stand

FEBRUARY FOR *Metals Review* marks the beginning of a new year in the literature annotating business, and is always accompanied by a hankering to tinker with the inner mechanics of the classification system. The hankering was kept pretty well under control this year, largely because of the activities of a new committee working on a literature classification system adaptable to punch card filing—a system that we hope can also be followed by the Review of Metal Literature next year.

So the only change that will be apparent to faithful readers in this issue is what appears to be the lopping off of two whole sections, but is actually only a rejuggling into a more logical arrangement.

One of the missing sections is old No. 25 on "Statistics". This was a misnomer anyway, implying something to do with economics and business trends —a field outside the jurisdiction of *Metals Review*. Technical articles only should come under the wing of the Literature Review, and those having to do with ore resources (formerly included in Section 25) have been readily absorbed in Section 1, now renamed "Ore Beneficiation and Reserves".

The other change is the abandonment of a separate section for books, classifying them in the sections which come closest to covering their subject matter. The books are grouped at the beginning or end of each section for ready reference, and a deal of subject cross-indexing is thus eliminated.

One of the strongest temptations that had to be throttled was to make a drastic cut in Section 20 on "Machining". This section covers not only all articles in the technical press having to do with the metallurgical aspects of metal cutting, but also those that are merely descriptive of the tools and operations. Just how dear to the hearts of A.S.M. members and *Metals Review* readers are such articles of a purely mechanical or shop nature has long been open to debate.

Can the readers come to our rescue here? Opinions as to the value of such a comprehensive machining section would be highly appreciated. A large saving in cost and labor in this section might quite properly be devoted to expansion along more useful lines.

Questions We Can't Answer Department

A certain machine part made of cast aluminum alloy required a hard steel insert for wear. Its size is about 2 in. long, 1 in. wide, ¾ in. thick. Naturally the cost should be low and the metal as machinable as possible, since considerable production is involved. The plan was to "cast-in" the insert; its business end would reach a temperature of 750 to 800° F. for about 5 min., and then cool fairly rapidly, and at the end be at least Rockwell C-52 hard (Brinell 500). What steel could be used?

Suggestions: None of the standard S.A.E. analyses with carbon up to 0.50 or 0.60% will be that hard after an 800° F. draw. For example, the charts on p. 455 of Metals Handbook show that the maximum hardness of 0.45% C steels quenched and drawn to 800° F. will be C-46, and Fig. 7 on the next page indicates that raising the carbon to 0.55% will raise the hardness only 3 points.

High speed, nondeforming and certain hot work steels come to mind as retaining hardness after high draws, but the cost of these steels is a barrier; the insert in question is fairly large.

The chief metallurgist of one of the large mining machinery manufacturers was approached on this problem and he writes:

"We use A.I.S.I. stainless steel Modified Type 501 (5.0% chromium, 0.50% molybdenum, with 0.20% carbon or 0.30 to 0.35% carbon). This maintains its hardness very well on tempering to 550° F. I have hardness-depth curves on this material after carburizing, hardening and tempering. Don't ask me why we have carburized such a material but the outside layers after drawing to 800° F., have a hardness of Rockwell C-55, so it would seem entirely within reason to maintain C-52 after an 800° F. draw."

Any other suggestions will be welcomed.—M.R.H.

Notch Brittleness Is Vital Factor in Welded Ship Failure

Reported by Melvin R. Myerson
National Bureau of Standards

Keen analysis and far-reaching experience were revealed by Samuel L. Hoyt in discussing welded ship structures before a joint meeting of the Washington Chapters of the American Society for Metals and American Welding Society on Dec. 17. The causes for failures of welded ships have been receiving much attention in recent years, and after studying some of the results of these investigations, Dr. Hoyt is convinced that the most important consideration in the selection of steel and design for welded ship construction is notch brittleness.

This is not a new idea; in fact, it was advanced in the *Journal* of the Iron and Steel Institute in 1875. Between 1880 and 1900 many prominent metallurgists realized that tensile tests did not give the entire story. In 1901, Izod of England introduced his well-known test, and in 1904, a treatise was prepared in France on the notch tests of steel (Charpy). Work on notched bar testing was a little slow in getting started in this country, for up until 1920 only two papers had been published on the subject.

With the coming of the Charpy notched-bar test the term "impact test" arose, which is an unfortunate misnomer. Dr. Hoyt illustrated this point by the S. S. Schenectady which broke in half at its pier in 1943. The significant low Charpy notched-bar values obtained on samples of steel from this ship were disregarded by a prominent engineer because he believed the ship had not been subjected to shock.

Data are expected from the National Bureau of Standards which will be quite conclusive in confirming the importance of ship steel having sufficient notch toughness. As a guide to future researches in this field, Dr. Hoyt suggested that transition temperatures be considered only as to whether the steel has sufficient notch strength at the temperatures it is to be used in service, and not how low a temperature has to be reached before the strength is unsatisfactory.

A word of caution was inserted for users of the shallow Izod notch. This notch gives inaccurate results at high temperatures due to a bending effect in the specimen which adds an unknown error to the energy reading. Half, double, and triple-width notched specimens employed at the service temperature under certain comparative conditions were recommended as a possible way of obtaining data without resorting to the use of varying temperatures with the single-width specimens. Dr. Hoyt stressed the importance of correlating between laboratory and service conditions in any tests that are used.

Four factors contributing to the failure of welded ships were summed up as (*a*) notches in the ship structure, (*b*) internal stresses, (*c*) air temperature (shrinkage stresses), and (*d*) service stresses.

Warren Celebrates Holiday

Reported by E. W. Husemann
Metallurgist, Copperweld Steel Co.

Warren Chapter of A.S.M. had its annual Christmas party and ladies night at the El Rio Cafe on Dec. 16. Approximately 70 members and guests indulged in a festive punch bowl after which a delicious turkey dinner was served. Following the dinner Ed Husemann and the Copperweld Quartet rendered appropriate seasonal numbers.

Joseph Tholl, handwriting expert from Cleveland, gave an illustrated talk on questionable documents which covered many phases ranging from anonymous letters and forgeries to infrared photography. Several door prizes were distributed, after which music and dancing was enjoyed.

Represents A.S.M. in N.A.C.E.

A. E. White, director of engineering research, University of Michigan, and a past president of the American Society for Metals, has been named to represent that society in the National Association of Corrosion Engineers.

Practical Lecture Course Presented

At the First Meeting of the Lecture Course on "Practical Metallurgy of Steel" Presented by the Worcester Chapter A. S. M. Are (Left to Right): Curtis R. Pardee, Educational Committee Chairman; Lloyd G. Field, Who Lectured on Practical Heat Treatment; Chester M. Inman, Chairman Emeritus, Who Initiated the Series; and Leo P. Tarasov, Chapter Chairman

Reported by C. Weston Russell
Wyman Gordon Co.

Worcester Chapter A.S.M. presented an educational series during November on the practical metallurgy of steel and the use of carbide tools in high-speed planing. The course was designed for the man in the shop and was a sequel to the highly successful course of lectures presented by the chapter last year. These were written by Chester M. Inman of the local chapter, and have been running serially in recent issues of *Metals Review.*

Three lectures were presented during the current series, the first by Lloyd G. Field of Greenman Steel Treating Division, New England Metallurgical Corp., on "Pitfalls in the Practical Heat Treatment of Steel".

Howard J. Stagg of Crucible Steel Co. of America presented the second lecture on "Selection and Proper Uses of Toolsteels", while the third lecturer was W. P. Coomey of Rice Barton Corp., who spoke on "High-Speed Planing With Carbide Tools".

Templin Is York Speaker

Reported by A. S. Rose
Metallurgist, R.C.A. Victor Div.

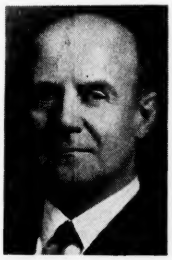
R. L. Templin, assistant director of research for the Aluminum Co. of America and president of the American Society for Testing Materials, addressed the York Chapter A.S.M. at the Dec. 8th meeting in Lancaster.

A review of Mr. Templin's interesting talk as it was presented to another chapter appeared in the December issue of *Metals Review.*

Two Montreal Members Receive Awards; Ellis Speaks on Powder Metallurgy

Reported by W. S. White
Johnson Wire Works, Limited

Two members of the Montreal Chapter A.S.M. were presented with well-merited awards from the National Office of the Society at the December meeting. C. F. Pascoe of Canadian Car & Foundry Co., Steel Foundries Division, received the Distinguished Service Award for important development of alloy cast steels for general engineering use in Canada, and E. C. Pearson of Aluminium Laboratories received first prize for "best in show" at the Metallographic Exhibit at the convention in Philadelphia.



O. W. Ellis

O. W. Ellis, director of the department of engineering and metallurgy of the Ontario Research Foundation, was the guest speaker; his subject powder metallurgy. The manufacture of materials and parts by powder metallurgy methods is approximately 100 years old, he pointed out in a brief historical introduction. Some of the earliest work was done on platinum.

Tungsten was another metal which, after sintering, could be swaged and drawn into wire. Tungsten wire, with a tensile strength as high as 850,000 psi., is one of the strongest materials known. This tungsten wire made possible the expansion of the electric lighting industry.

Powders may be manufactured by a number of methods: (*a*) reduction of oxides or metal salts, (*b*) electrolysis, (*c*) decomposition of carbonyls, (*d*) atomization, (*e*) grinding, (*f*) intercrystalline corrosion (*g*) condensation of metallic vapor.

Blending and mixing is the first step in the mechanical process. Desired alloy mixtures are prepared at this point.

The next step is pressing of the powder in a mold to form a compact. Pressing from both top and bottom is often desirable. Segmented dies are sometimes used to facilitate the extraction of the compact. Close tolerances are required between the die and punch or plunger. Compacting pressures often have an important bearing on the strength of the compact after sintering.

The "green" compacts are then placed in a sintering furnace. With certain types of powders it is necessary to provide a controlled atmosphere, and work is currently being done on sintering in vacuum furnaces. This is essential with some metals or alloys; it is a difficult operation, but results sometimes justify the use of such equipment.

Green compacts may be fragile and difficult to handle. However, after sintering, strengths may range to 200,000 psi., depending on a number of controllable variables. Sintering will cause a reduction in volume of up to 35%.

Dr. Ellis classified the uses for the sintered compacts into several categories, namely ordinary (such items as bearings), hard (carbide cutting tools), heavy (special alloys used in atomic energy work), magnetic (for permanent magnets), refractory (for metals which must withstand heat).

In the speaker's opinion, manufacture of parts by powder metallurgy will in all probability remain a specialized field and never take the place of such methods of production as casting, forging, rolling and machining. Powder metallurgy will, however, continue to expand in those fields where special properties are desired. It will also continue to expand because metals can be manufactured into usable parts which cannot be made as cheaply in any other way.

Fall Show in Cleveland

Cleveland will be host to the 31st National Metal Congress and Exposition in 1949 at the city's huge Public Auditorium on Oct. 17 through 21. Floor plans for the Cleveland show have been mailed to previous exposition exhibitors and space assignments will be made on March 12.

The exposition will require the entire space of both floors of the Public Auditorium, as well as all of the area underground—250,000 sq. ft.

The Housing Bureau has already been set up and is functioning under the direction of Mrs. Louis D. Perkins, 511 Terminal Tower, Cleveland 13, Ohio.

Midvale Names Representative

The Midvale Co. has appointed the John C. Riley Co., Houston, Texas, as its district sales representative in the states of Louisiana, Arkansas, Oklahoma and Texas.

18 Elements Used to Form Commercial Alloys of Aluminum

Reported by Alvin G. Phillips
Metallurgical Division
Caterpillar Tractor Co.

The properties of aluminum and the effect of the common alloying elements on these properties formed the subject at a recent meeting of Peoria Chapter, A.S.M. The speaker was Kent R. Van Horn of the Aluminum Co. of America, whose recent promotion is detailed on page 12.

Dr. Van Horn pointed out that pure aluminum has many useful properties, namely high heat and electrical conductivity, very light weight, and good resistance to corrosion. It is, however, soft, does not cast well, and is difficult to machine. Eighteen elements are commercially added to aluminum to change the properties of the pure metal to those required for the many industrial needs it fulfills.

The elements used in aluminum can be divided into two classes. Those of Class I—namely, copper, magnesium, silicon, and zinc—form a solid solution with the aluminum and make it susceptible to solution heat treatment. Class II alloys are usually added in small amounts to modify the alloys formed by the Class I elements. A brittle phase is formed with small amounts of Class II alloys and these alloying elements do not make aluminum susceptible to solution heat treatment.

Copper is added to aluminum to increase its strength, casting properties, and machinability, but in large quantities it decreases ductility. Copper alloys, after solution heat treatment and aging, can attain a tensile strength of 47,000 psi.

Aluminum-silicon alloys are used primarily for their good foundry characteristics. Silicon does not increase strength as much as copper and often the two elements are used in the same alloy to obtain the strengthening effect of the copper and the casting qualities of the silicon.

Magnesium increases the machinability of aluminum and its resistance to corrosion by alkalis. The use of magnesium presents some problems in the foundry, but castings made from aluminum-magnesium alloys have high tensile properties.

Zinc is not widely used as a single alloying element with aluminum. The most promising of the new high-strength alloys is made with magnesium and zinc added to aluminum in a fixed ratio. Tensile strength as high as 100,000 psi. has been obtained experimentally with this type of alloy. Although this alloy originally was susceptible to stress-corrosion cracking, recent developments have eliminated this defect.

Van Horn Named Asst. Director of Research for Alcoa

Kent R. Van Horn, chief of the Cleveland branch of Aluminum Research Laboratories since November 1945, and a past national president of the American Society for Metals, has been named an assistant director of research for the Aluminum Co. of America. Maurice W. Daugherty, assistant chief of the Cleveland laboratories, succeeds Dr. Van Horn as chief.

K. R. Van Horn

Dr. Van Horn will remain in Cleveland and will continue to devote his talents to the improvement of Alcoa casting and forging processes and alloys, the special function of the Cleveland Research Division.

M. W. Daugherty

A 1926 graduate of Case Institute of Technology, he went to Yale University for his doctorate. He joined Alcoa in 1929 as a research metallurgist, and has since been the author of more than 35 technical articles, and coauthor of the textbook, "Practical Metallurgy" published by the American Society for Metals. He was president of the A.S.M. in 1944 at the age of 39. An authority in the field of industrial X-ray, Dr. Van Horn is also a past president of the American Industrial Radium and X-Ray Society.

Mr. Daugherty received his degree in chemical engineering at Purdue University in 1923. Immediately following graduation he joined Alcoa's analytical laboratory at New Kensington. In 1926 he was named chief of the company's chemical laboratory at Niagara Falls. When that laboratory was closed in 1931, Mr. Daugherty came to the Cleveland Research Division to head the chemical metallurgy department.

Philadelphia Chapter Offers Metallurgical Scholarships

Two metallurgical Scholarships of $150 each for the college year 1949-50 are offered by the Philadelphia Chapter A.S.M. They will be known as the George L. Metzger Scholarships of the American Society for Metals.

The scholarships will be awarded for the best two papers on "Why I Have Chosen Metallurgy (or Metallurgical Engineering) as My Future Career". The papers are to be submitted by a member of a science club or similar group in a Philadelphia secondary school. They may be used in any accredited college or university (not limited geographically) having a degree curriculum in metallurgy or metallurgical engineering.

The scholarships will be awarded about May 1, 1949. The judging will be done by the Educational Committee of the chapter.

Canton Has President's Night

Reported by J. C. Selby
Metallurgical Department
Timken Roller Bearing Co.

President's night of the Canton-Massillon Chapter A.S.M. was held on Dec. 15 at the Mergus Restaurant in Canton, Ohio, with H. K. Work of Jones & Laughlin Steel Corp. as the featured speaker. Dr. Work's topic was "Some New Developments in Steelmaking."

H. A. Morrow of The Bowdil Co. presided, and S. W. Poole of Republic Steel Corp. introduced the speaker.

Dr. Work discussed two topics—semi-plant development methods in steelmaking, and the effect of different factors on the cold working of steel. The talk is being presented before a number of chapters during the current season.

New Series of "Techbooks" Is Initiated by A.S.M.

The first in a new series of "Techbooks" has been issued by the American Society for Metals. The initial volume, "The Story of Magnesium" is written by W. H. Gross of the technical department of the Dow Chemical Co., Midland, Mich.

The new series of books is designed for self-education and is intended to provide young men and women who are not engineering graduates with the technical information needed to understand the science of metals as it is applied in industrial production. "The Story of Magnesium", for instance, is written in simple phraseology and has been reader-tested by a high school student. Future Techbooks will cover such subjects as iron and steel manufacture, nonferrous castings, forgings, and principles of welding.

To aid instructors, the charts and illustrations in "The Story of Magnesium" have been made into a film strip which is available from A.S.M.

Revere Forms Coast Division

Revere Copper and Brass Inc., has announced the formation of a Pacific Coast Division, with headquarters in the new Revere mill in Los Angeles. Copper and copper alloy tube and brass rod will be the principal products fabricated at the new manufacturing plant, which is expected to be in operation soon after the first of the year. Wallace H. Hitchcock has been named manager.

Speakers on Grinding, Safe Cracking

Left to Right at the Jan. 3rd Meeting of the Terre Haute Chapter A.S.M. Are: William R. Huff, Chapter Chairman; H. A. Blessing of the Norton Co., Principal Speaker; and Ed Tetzel, a Local Machine Shop Owner and Gun and Lock Expert Well Known Throughout the Wabash Valley. Mr. Tetzel recounted some of his interesting experiences in safe cracking —legitimate, that is. Mr. Blessing used slides to illustrate a clear exposition of grinding and grinding imperfections, their cause and cure. (Reported by M. E. Hansell, Rose Polytechnic Institute)

Welding Hardenable Steels and Large Structures Are Recent Developments

Reported by W. P. Wallace
University of California

"The development of gas-shielded electrodes marks the dividing line between the old and the new in welding," said S. L. Hoyt of Battelle Memorial Institute in an address before a joint meeting on Nov. 18 of the Los Angeles Chapters of the American Society for Metals and American Welding Society. Two developments have come in more recently, he continued. These were based on the engineer's desire to weld hardenable steels and their persistent demands to join large structures by welding.

Although progress has been made along these lines, there are still many problems in welding. "It is not easy to jump from small welded parts to large structures; when it comes to hardenable steels, there are still differences of opinion as to the welding problems involved," were Dr. Hoyt's comments.

Illustrating his paper with slides, the speaker showed that even hardenable steels may be rated readily weldable with some precautions. In the aircraft steels (S.A.E. 4130 and 8630), the cracking tendency after welding diminishes or entirely disappears if the steel is cold worked and receives a subcritical anneal prior to welding. The reasons for this improvement are attributed to aluminum deoxidation or the amount of acid soluble aluminum present, the type of carbides formed and their geometry. If the carbides are of the alloy type (not Fe_3C) and are relatively large in size, the cracking tendency is at a minimum.

Dr. Hoyt explained the function of preheating on the basis of S-curves. Numerous tests have shown that preheating must cause the transformation of the austenite. Relatively high preheating temperatures do not eliminate the cracking tendency because they do not transform the austenite of the heat-affected zone, unless very long preheats are used.

High hardness in the heat-affected zone is not a sure indication of possible cracking; rather, it is the presence of retained austenite in the heat-affected zone and its high solubility for hydrogen which will lead to cracks. The use of the low-hydrogen type of electrodes will minimize the cracking tendency.

According to Dr. Hoyt, cracks after welding are caused by (*a*) hydrogen, (*b*) chemical composition and initial structure, (*c*) the retention of austenite by the heating and cooling cycle, and (*d*) the stress system. Elimination of any one of these will minimize the cracking tendency.

In Dr. Hoyt's opinion, the present tests for weldability are of no value to the designer of large structures though they may be helpful to the welding engineer. The next big problem facing the welding industry is to give the designing engineer the information he needs by showing how to design for the steel he can afford to buy.

S. L. Hoyt Addressing the Los Angeles Chapter on Welding Metallurgy

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Educational Lectures Are On Manufacture of Steel

Reported by R. M. McBride
Universal Products Co., Inc.

On three successive Monday evenings, beginning Nov. 15, the Detroit Chapter A.S.M. presented the fall series of educational lectures on the general theme of the manufacture of steel.

The opening lecture, entitled "Practical Aspects of Openhearth Steelmaking", was given by C. L. Altenburger, research engineer, alloy division of Great Lakes Steel Corp. The second week E. O. Dixon, chief metallurgical and mechanical engineer, Ladish Co., spoke on "Drop Forging Practice Today". He was followed by William Rodgers, assistant chief metallurgist, Republic Steel Corp., who discussed "Rolling Mill Practices for Carbon and Low-Alloy Steel".

The speakers discussed some of the recent advances that have been made in their respective fields, amply illustrated by slides and the relationship between the processing techniques and the costs and characteristics of the finished products. The meetings were open to all.

George Timmons and Bob Thomson are cochairmen of the Educational Committee, the former having charge of this particular series.

THIRTY YEARS AGO

After a short life as independent organizations, the Steel Treating Research Society and the American Steel Treaters Society merged in 1920 to form the present American Society for Metals. The early issues of the official publications of these two societies (1917-1920) are filled with nostalgic and historical associations.—Ed.

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First paper in the first issue of the *Proceedings* (and one of the earliest and most popular lectures given before local chapters) was on "Steel, Its Selection and Treatment" by Prof. John F. Keller of Purdue University, "the learned blacksmith". Reason for its popularity was Keller's ability to explain in layman's language the complexities of the "critical range" in steel.

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Quoting from Professor Keller's explanation of the critical temperature: "To the trade this temperature is indicated by a light or dark cherry red color, depending on the intensity of the light—and cherries are all colors (especially on Monday morning). Sight and health are then important factors in this method of determining the above point . . . "

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Professor Keller continued to give his famous lectures for many years, once addressing a group of 524 men from Bethlehem Steel Co. alone. The lectures were finally collected and published in book form in 1928—an early best-seller in the long line of A.S.M. metallurgical textbooks.

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Sustaining members in those days were known as "patron members", and in October 1918 the *Journal* lists five of them. (There are 1659 sustaining memberships today.) The first five included Central Steel Co. (a predecessor of Republic Steel Corp.), Columbia Tool Steel Co., and Latrobe Electric Steel Co.

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Clarence H. Beach was the representative on the Central Steel Co.'s membership. He is still an active member of the Indianapolis Chapter A.S.M. Columbia Tool Steel Co. was represented by Arthur Clarage, father of the Arthur Clarage we know today, who is a former national treasurer of the society.

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Another patron member was listed as Harold C. Smith, at that time president of Illinois Tool Works, where the offices of the society were maintained in a corner of the machine shop.

Compliments

To AUGUSTUS B. KINZEL, president, Union Carbide and Carbon Research Laboratories, on his election as vice-president of the American Institute of Mining and Metallurgical Engineers.

♦ ♦ ♦

To FRANCIS B. FOLEY, superintendent of research, the Midvale Co., and past president A.S.M., on his selection to deliver the A.I.M.E. Howe Memorial Lecture for 1950.

♦ ♦ ♦

To LEROY L. WYMAN, research metallurgist, General Electric Co., to WENDELL F. HESS, head of the department of metallurgical engineering, Rensselaer Polytechnic Institute, and MATTHEW A. HUNTER, dean of the faculty, Rensselaer Polytechnic Institute, on the award of Army-Navy Certificates of Appreciation for wartime services.

♦ ♦ ♦

To JOHN W. HARSCH, chief engineer of Leeds & Northrup Co., who recently was honored on the 25th anniversary of his employment by this firm.

♦ ♦ ♦

To IVOR JENKINS, director of the research laboratories for the British General Electric Co., on the degree of Doctor of Science conferred by the University of Wales for work in the field of metallurgy.

♦ ♦ ♦

To JOHN D. SULLIVAN, assistant director of Battelle Memorial Institute, on his appointment as chairman of the new Extractive Metallurgical Division of the American Institute of Mining and Metallurgical Engineers.

♦ ♦ ♦

To THOMAS A. FRISCHMAN, chief metallurgist, axle division, Eaton Mfg. Co., on winning second prize of $300 in the Industrial Furnace Manufacturers Association prize contest for 1948. The prize was awarded for his article on "Controlled Atmosphere Cycle Annealing" published in *Iron Age*.

♦ ♦ ♦

To FRED P. PETERS, editor-in- chief of *Materials & Methods*, on his election as vice-president of Reinhold Publishing Corp. and publishing director of the book division. Also to THEODORE C. DUMOND on his promotion from managing editor to editor of *Materials & Methods*. Mr. Peters will also continue with *Materials & Methods* as editorial director.

Appointed Jessop Distributor

L. E. Zurbach Steel Co., Somerville, Mass., has been appointed by Wm. Jessop & Sons, Ltd., as distributors and stockists for Jessop tool-steels made in Sheffield, England.

Clad Steels Used For Large Equipment; Welding Done by Commercial Means

Reported by John W. Sweet*

Chief Metallurgist, Boeing Airplane Co.

"The Manufacture, Fabrication, and Application of Clad Steels" was portrayed by a movie and illustrated lecture before the Puget Sound Chapter A.S.M. A joint meeting with the American Welding Society, it was addressed by William G. Theisinger, manager, sales development, Lukens Steel Co.

Dr. Theisinger covered the methods of applying cladding and showed the uniformity of cladding thickness over the cross section of the composite plate. Using this material, large, corrosion resisting equipment can be constructed which otherwise would not be economically possible. The Lukens clad steels are produced by hot rolling the cladding onto carbon or low-alloy steel. At the high temperatures employed, nickel, inconel or monel and steel form a plastic bond whose adhesive strength is equal to the shear strength of carbon steel itself.

Shear tests are made to determine strength of bonding. The bond must be capable of developing 20,000 psi. shear strength to meet A.S.M.E. specifications. Lukens clad steels exceed this requirement, averaging 50,000 psi. shear strength or better.

Slides illustrated proper welding technique. Proper joint preparation and sequence of welding the base metal and cladding should be observed to insure the best physical properties and maximum corrosion resistance. Typical applications of clad steels were shown, and a color film covering the manufacture of Lukens clad steels completed a very interesting presentation.

Reported by Clyde R. St. John*

Metallurgical Engineer

Permanente Metals Corp.

Welding and cutting of clad steels are done by commercial means, according to W. G. Theisinger of Lukens Steel Co., addressing the Inland Empire Chapter A.S.M. in a joint meeting with the American Welding Society.

When cutting the clad steel the carbon steel side is cut through first. When welding, the carbon side is welded first. The welding groove on the carbon steel side should not extend into the cladding, but about 3/32 in. should be left to be butted together. The weld is then made in the usual manner and no pickup of the clad is effected.

The clad side is then chipped out and welded with a rich alloy in the first pass and then with the standard alloy for the cladding material. For instance, when welding the clad side of a stainless steel clad plate, the first pass would be welded with a 25-20 composition and subsequent passes with 19-9.

Clad steels are utilized industrially in the oil industry for pressure vessels and other applications where a corrosion resistant material is needed. A saving in cost is realized over the use of a corrosion resistant plate of a single composition. Often a saving of installation cost can be had by paying a slight width extra in the purchase of the plate, thereby saving the welding and labor costs of fabrication.

* Excerpts covering different aspects of Mr. Theisinger's talk have been selected from both Mr. Sweet's and Mr. St. John's reports.

Technical Papers Invited

The Publications Committee of the A.S.M. will now receive technical papers for consideration for publication in the 1950 *Transactions*. A cordial invitation is extended to all members and nonmembers of the A.S.M. to submit technical papers to the society. Many of the papers approved by the committee will be scheduled for presentation on the technical program of the 31st National Metal Congress and Exposition to be held in Cleveland, Oct. 17 to 21, 1949. Papers that are selected for presentation at the Convention will be preprinted and manuscripts should be received at A.S.M. headquarters office not later than April 15, 1949.

Manuscripts in triplicate, plus one set of unmounted photographs and original tracings, should be sent to the attention of Ray T. Bayless, assistant secretary, American Society for Metals.

Headquarters should be notified of your intention to submit a paper, and helpful suggestions for the preparation of technical papers will be sent.

Stevens Gets Scholarship Fund

A bequest of $70,187 from the estate of the late Eugene Eldricht Hinkle, to be used to establish a memorial scholarship fund, has been received by Stevens Institute of Technology. The fund will be used for the assistance of any worthy student attending Stevens Institute.

Megacycle Ranges Offer Advantages For Induction Heating

Reported by James M. Loiacono
Eclipse-Pioneer Div.
Bendix Aviation Corp.

The expanding field of "Induction Heating" was explored by the New Jersey Chapter A.S.M. at a meeting featuring Vernon W. Sherman, president and chief engineer of the Sherman Industrial Electronics Co., as speaker. The talk fell into three divisions: (*a*) the types of work that can be done by induction heating, (*b*) the types of coils and fixtures required, and (*c*) the types of induction equipment required. The lecture was lucidly supplemented by a number of informative slides.

The range of available frequencies for induction heating has steadily increased from the low-frequency motor-generator sets of 1917 to the spark-gap and vacuum tube sets of today which are used for kilocycle and megacycle heating. The applications of induction heating to industrial processes include a variety of heat treating operations, welding, brazing, soldering, selective localized heating, and glass-to-metal sealing.

The speaker emphasized the need for short, heavy coil leads physically close together so as to minimize the inductance loss frequently experienced on coils of the random wound type. A feature of megacycle induction heat as contrasted to the lower frequency forms (such as in the kilocycle range), is the ability of the megacycle energy to follow the contour of the workpiece, even though the heating coil does not perfectly follow the contour. Practical value of this and automatic contour following at the higher frequencies was shown with micrographs of hardened cases on fine gear teeth, heart-shaped cans and other surfaces of irregular shape.

It was recommended that prospective purchasers of induction heating equipment study thoroughly the range of their intended applications. For melting of alloys and for the heating of forging slugs, low-frequency equipment is used. For heat treating operations requiring moderately deep penetration of the heat, kilocycle frequencies are used. For shallow surface hardening, megacycle frequency heating is used.

The lecture underscored the following advantages of megacycle tube equipments.

1. Megacycle heating permits greater space between workpiece and coil than is practical at lower frequencies.
2. It is not necessary to rotate the work to secure a uniform surface heat layer.
3. Operation of the equipment is safe because voltage on properly designed coils is negligible.
4. Heat treatments are of extremely short duration—timed to a fraction of a second.
5. Accurate centering of the workpiece in the coil is not necessary.

The interest invoked by the lecturer in the subject matter was manifest in a lively discussion period.

Sustaining members of 15 years or more continuous membership were honored by the New Jersey Chapter at this meeting. Framed testimonials of appreciation were presented to representatives of these leading New Jersey industries. The chapter expressed its gratitude to these organizations.

Russian Translations Offered

Research Information Service, translators of foreign scientific and technical material, has introduced a new service of cataloging, translating and publishing in report form articles from current Russian technical and scientific periodicals. These reports are announced in bulletins which are issued periodically to cover specific fields. Bulletins listing translations of articles in the field of metallurgy will be available in the near future.

Further information may be secured from Research Information Service, 509 Fifth Ave., New York 17, N. Y.

Metallurgists Not Cost-Conscious Says McQuaid

Reported by John A. Rassenfoss
Research Metallurgist
American Steel Foundries

Present-day metallurgists are not conscious enough of costs. Such was the preface to a comprehensive review of the economics of present and future metallurgical practices in iron and steel production presented before a large attendance at the Executives' Night meeting of the Calumet Chapter on Dec. 14.

Harry W. McQuaid, the speaker, expressed the opinion that metallurgists are usually so absorbed with quality considerations that they tend to exceed service requirements by an unnecessarily large margin and thus needlessly increase costs. Excess quality is of no value and the metallurgist should be careful to analyze processing so that the most economical specifications are suitable.

While dealing with this consideration, the speaker stated that tests which measure large deformations before failure usually have very little practical value in predicting service life, especially in hardened and tempered products.

Semi-integrated steel mills should increase in number as a result of several recent developments, the speaker said. These are the increase in freight rates, the recent Supreme Court decision on the basing point system for marketing steel, and the advantages offered by recent developments in electric furnace practice, ingot manufacture and rolling mill design. The speaker predicted that the top-charged, high-powered electric furnace would be used even more in the future for making high-tonnage steels. Scrap and power availability are the primary limiting factors on the expansion of electric practice.

An interesting observation offered by Mr. McQuaid was that high FeO content slags (35%), which can most easily be made in the electric furnace, give marked improvement in rimming steel, and in the rolling quality of semikilled high-sulphur steels, by greatly reducing the bloom cracking normally encountered.

The small ingot sizes which are most economical in the smaller mills are proving to be superior in over-all quality. Rimmed and semikilled steels seem very satisfactory when made in the smaller ingot sizes—11 in. or less. Also discussed were present trends in steel plant expansion, bessemer usage and the employment of oxygen in ferrous metallurgy.

A most interesting coffee talk by Oscar T. Lohner, passenger agent, Transcontinental and Western Air Lines, preceded the principal address.

Principles of Grinding Portrayed by Sound Film

Reported by Leston B. Stark
Metallurgist, U. S. Navy Electronics Laboratory

The November meeting of the San Diego Chapter A.S.M. featured a 16-mm. sound film entitled "First Principles of Grinding", presented by the Carborundum Co. of Niagara Falls, N. Y. An accompanying commentary was presented by E. F. Konker, southwestern representative on grinding products for the Carborundum Co.

The film covered basic factors in grinding, definition of terms, history, and early background of grinding. A comprehensive view of the raw materials and processes used in the manufacture of two major cutting materials, Aloxite and Carborundum, was shown.

The materials and processes used in the maunfacture of various types and grades of grinding wheels and their uses were enumerated. A uniform, industry-wide identifying code is used for grinding wheels, and each letter and numerical symbol was explained as to origin and specific usage.

The discussion brought up a variety of specific applications and corrections of grinding problems. Among the most interesting were a discussion of high-speed, high-infeed surface grinding (0.015 in. per stroke), and the use of abrasive particles in powdered form for polishing and lapping.

Past Chairmen Honored

Mahoning Valley's Past Chairmen Who Were Honored at the Meeting on Dec. 14 Include: Top Row, Left to Right—L. D. Woodworth (1939), J. A. Ritz (1947), M. A. Hughes (1946), E. E. McGinley (1941); Front Row—D. W. Hadsell (1940), J. E. Phillips (1948), and J. G. Cutton (Technical Chairman of "Oddity Night"). Photo by Henry Holberson

Reported by J. G. Cutton
Metallurgist, Carnegie-Illinois Steel Corp.

At the Mahoning Valley Chapter's meeting on Dec. 14 in Youngstown, the past chapter chairmen were honored by the presentation of engraved certificates. The past chairmen present then acted as judges at the technical session, where several members presented "metallurgical oddities".

These oddities consisted of freaks of metallurgy in which no apparent solution was found. For example, one oddity was a 25-12 stainless tube used in an ammonia still which failed in service and was as pliable as a rubber hose. Much interest and discussion was provided by the oddities presented, and a prize of an A.S.M. book was given to the member who brought the oddest "oddity".

Manitoba Speaker Tells About Flame Conditioning

Reported by L. L. Dixon
Manitoba Bridge and Iron Works

Manitoba Chapter A.S.M. at its regular monthly meeting on Dec. 9, heard Norman H. Cuke, on "Flame Conditioning". Mr. Cuke is associated with the development and engineering department of the Canadian Liquid Air Co., Limited.

Mr. Cuke traced the development of theories of corrosion and the eventual acceptance of the electrolytic theory. By liberal use of slides the speaker illustrated examples of flame conditioning on actual structures. The use of different tips and of portable generating equipment was explained. An interesting discussion period preceded the closing of the meeting.

Programs Planned For Western Show

Programs and plans are rapidly taking shape for the Western Metal Congress and Exposition, April 11 through 15 in Shrine Convention Hall, Los Angeles. With 20 technical societies cooperating, the combined event will particularly feature topics and displays pertaining to ferrous and nonferrous metals for petroleum, chemical, manufacturing, aviation, mining and other western industries.

Technical sessions will be held by the American Society for Metals, American Foundrymen's Society, American Institute of Mining and Metallurgical Engineers, and American Welding Society.

In addition to societies presenting technical sessions, the following are cooperating in the general plan: American Chemical Society, Society for Non-Destructive Testing, American Institute of Electrical Engineers, American Petroleum Institute, American Society of Civil Engineers, American Society of Mechanical Engineers, American Society for Testing Materials, Pacific Coast Electrical Association, Pacific Coast Gas Association, National Purchasing Agents Association, Society of Automotive Engineers, Western Oil and Gas Association, and others.

To complement the technical sessions, leading firms in the metal industries through the nation will display their products and equipment at the Western Metal Exposition in the Shrine Auditorium.

Educational Seminar Covers Fundamentals Of Physical Metallurgy

Reported by Leston B. Stark
Metallurgist, U. S. Navy Electronics Laboratory

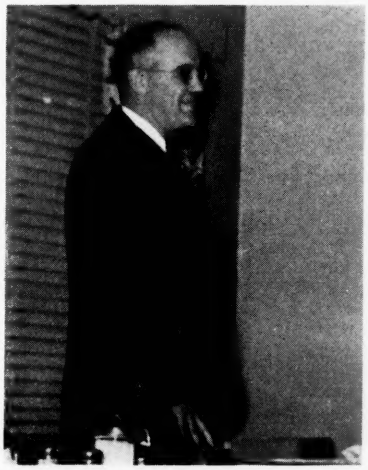
An educational series was inaugurated by the San Diego Chapter A.S.M. on Dec. 14. The topic discussed at this first meeting of the series was "Fundamentals of Physical Metallurgy". The seminar leaders were John Crane, Ryan Aeronautical Co., Chapter vice-chairman; Laird Gale, U. S. Naval Station, secretary; and Leston B. Stark, U. S. Navy Electronics Laboratory, program chairman.

The seminar was divided into three major sections. First was the nature and formation of metals, metal crystals and crystal structure. The topics covered included the electronic structure of metals, reasons for electrical conductivity, and an explanation of simple crystal structure as related to mechanical and physical properties.

The second section, devoted to alloys and phase diagrams, covered substitutional and interstitial solid solutions, binary, ternary, and pseudobinary phase diagrams, Gibbs phase rule, the Lever Rule as applied to phase diagrams, and a preliminary discussion of the iron, iron carbide equilibrium diagram.

The final discussion was devoted to the practical significance of phase diagrams, with the iron, iron carbide diagram used as a model. The various processes of ferrous heat treatment, such as annealing, normalizing, hardening, tempering, austempering, martempering, and spheroidizing, were explained singly and in their mutual relationship to the iron, iron carbide phase diagram.

Work Takes New Position at N. Y. U.



A.S.M. President Speaking Before Dayton Chapter on Recent Developments in Steelmaking

Reported by O. G. Saunders
Metallurgist, Hobart Mfg. Co.

The December meeting of the Dayton Chapter A.S.M. was doubly enjoyable, since, on the occasion of National Officers' Night, the speakers were Harold K. Work, national president of A.S.M. and director of research of the Jones and Laughlin Steel Corp., and W. H. (Bill) Eisenman, A.S.M.'s inimitable national secretary.

Mr. Eisenman told of the recent National Metal Congress and Exposition at Philadelphia, and related how the year 1948 was outstanding for the society, since it saw the new A.S.M. Metals Handbook published.

Dr. Work chose for his talk "Some Recent Developments in Steelmaking" and gave an interesting account of the experimental furnaces at J. & L.

After the speeches, the group was shown a United States Air Force film entitled "The Atom Strikes". It depicted the devastation brought about by the atomic bombing of Hiroshima and Nagasaki.

A.S.M. President Harold K. Work has resigned his position as director of research, Jones & Laughlin Steel Corp., to become associated with New York University. Dr. Work has been appointed director of research, College of Engineering. New York University is one of the major schools of higher education, with the second largest student enrollment in America.

Dr. Work returns to the scene of his academic training, having acquired his degree of Chemical Engineer from nearby Columbia University in 1925. Further training in line with his new responsibilities was acquired at the Mellon Institute of Industrial Research in Pittsburgh. Concurrent with this, he did graduate work at the University of Pittsburgh, receiving his Ph.D. from the latter institution in 1929.

Practical experience in the field of research was gained with the Aluminum Co. of America, where he was division head, Aluminum Research Laboratories, from 1929 to 1934, and chemical engineer in the company's jobbing division from 1934 to 1936. Since 1936, Dr. Work has been with Jones & Laughlin, where he was director of research and development.

Symposium Planned on Cooperative Research

The University of Minnesota, through the facilities of its Institute of Technology and of the Center for Continuation Study, will conduct a symposium on cooperative engineering research on March 14 through 16 on the Minneapolis campus.

The symposium will be presented with the cooperation of the Minnesota Chapter of the American Society of Engineering Education. It will seek to bring about better understanding and a closer relationship in cooperative engineering research between universities, industries, and governmental agencies. Among those who have accepted the University's invitation to appear on the program is Edgar C. Bain, vice-president, research and technology, Carnegie-Illinois Steel Corp., and a past president of the American Society for Metals.

Further information may be obtained by writing to the Director, Center for Continuation Study, University of Minnesota, Minneapolis 14.

Opens New Cleveland Office

Kinney Manufacturing Co., Boston, manufacturer of liquid pumps, vacuum pumps, clutches and bituminous distributors, announces the opening of a branch office at 2036 E. 22nd St., Cleveland 15, Ohio. William B. Mills, formerly of Chicago, will be manager.

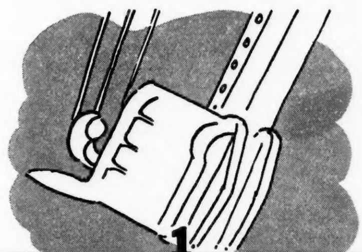
CHAPTER MEETING CALENDAR

CHAPTER	DATE	PLACE	SPEAKER	SUBJECT
Akron	March 9	University Club	O. W. McMullan	Metallurgical Factors Affecting Machinability
Baltimore	March 21	Engineers' Club	C. W. Merrill	Raw Metallic Sources
Birmingham	March 1	Hooper's Cafe	R. Schneible	Applications of Aluminum Alloys
Boston	March 4	Hotel Sheraton	H. K. Work	National Officers Night
Calumet	March 8	Phil Smidt & Son, Whiting, Ind.	E. E. Howe	Metal Housing—A New Standard for Living
Canton-Massillon	March 14		Jack T. Wilson	The Basic Nature of Crystal Structure and Its Significance to Metallurgy
Chicago	March 14	Furniture Club	H. B. Osborn	Selective Methods of Heating and Hardening
Cincinnati	March 10	Engineering Society	Stewart M. DePoy	Selection of Materials and Special Heat Treatment for Tools
Cleveland	March 7	Cleveland Club	Blake Crider	Emotional Aspects of Living
Columbus	March 8	Fort Hayes Hotel	Peter Payson	High Alloy Steels
Dayton	March 2		Morris Cohen	The Tempering Operation
Des Moines	March 8	Younkers Tearoom	T. Embury Jones	Resistance Welding
Detroit	March 14	Rackham Educational Memorial		Steel Heat Treating
Eastern New York	March 8	Circle Inn	G. F. Applegate	Induction Heating
Georgia	March 15	Herren's Restaurant	F. L. LaQue	National Officers Night
Hartford	March 8	The Hedges	Jack T. Wilson	Industrial Radiography
Lehigh Valley	March 4	Hotel Traylor, Allentown, Pa.	Norman L. Mochel	Design and Use of Castings, Forgings and Weldments
Los Angeles	March 24	Rodger Young Auditorium		
Louisville	March 1		Peter Payson	Annealing of Toolsteel
Mahoning Valley	March 8	V.F.W. Room		Sustaining Members Night
Milwaukee	March 15	City Club		Wear
Montreal	March 7	Queen's Hotel	Harold K. Work	Some New Developments in Steelmaking
Muncie	March 8	Central High School	O. E. Cullen	Modern Trends in Gas Atmospheres
New Haven	March 17	Hammond Laboratory, Yale University	Robert M. Brick	Properties of Metals at Low Temperatures
New Jersey	March 21	Essex House, Newark	Joe Gursky	Nonferrous Metals in the Automotive Industry
New York	March 14	Building Trades Employers Assoc.	F. P. Zimmerli	Spring Materials
North Texas	March 23	Crown Tool, Fort Worth	R. E. Bockroth	Magnesium Alloys and Their Place in Industry
North West	March 17	Covered Wagon, Minneapolis	E. G. Mahin	Surface Hardening
Notre Dame	March 9	Engineering Auditorium, University of Notre Dame	G. A. Roberts	A "New Look" in Toolsteels
Ontario	March 4	Royal York Hotel		Ladies' Night
Ottawa	March 8	Murphy-Gamble's Rest.	H. K. Work	Some New Developments in Steelmaking
Philadelphia	March 25	Franklin Institute	J. H. Hollomon	Sauveur Lecture
Pittsburgh	March 10	Roosevelt Hotel		Young Fellows' Night
Purdue	March 15	Purdue Memorial Union Bldg.	H. W. McQuaid	Economics and Trends in the Production and Selection of Alloy Steel
Rhode Island	March 2		George P. Witteman	The Metallurgical Aspects of Machinability
Rochester	March 14	Lower Strong Auditorium, University of Rochester	Russell M. Franks	Stainless Steels
Rocky Mtn.	March 18	Oxford Hotel, Denver	J. E. Townsend	Modern Metals and Alloys
Pueblo Group	March 17	Minnequa Club	J. E. Townsend	Modern Metals and Alloys
Springfield	March 21	Hotel Sheraton	Waldemar Naujoks	Precision Forging
St. Louis	March 18	Forest Park Hotel	D. H. Rowland	Function of Alloying Elements in Steel
Southern Tier	March 14	Hotel Frederick, Endicott, N.Y.	E. M. Schrock and C. D. Ferris	Quality Control
Syracuse	March 1	Onondaga Hotel	L. P. Tarasov	Grinding Hard Steels
Terre Haute	March 7	Student Union, Indiana State	E. G. Mahin	National Officers' Night
Toledo	March 24	Maumee River Yacht Club	H. K. Work	National Officers Night
Tri-Cities	March 1		A. H. Hesse	Uses and Fabrications of Nonferrous Metals
Tulsa	March 8	Spartan Cafeteria	C. L. Clark	Alloys for High-Temperature Uses
Utah	March 22	Salt Lake City	N. F. Hindle	Castings and Casting Methods
Warren	March 10	El Rio Cafe	Frederick S. Mallette	Implications of Proposed Industrial Health Codes
Washington	March 14	Garden House, Dodge Hotel	J. T. MacKenzie	Modern Cast Iron
West Michigan	March 21	Park Congregational Church, Grand Rapids	R. G. McElwee	Cast Iron as an Engineering Material
Western Ontario	March 18	Elmwood Hotel, Windsor	V. E. Lysaght	Hardness Testing of Metals
Wichita	March 15	Knights of Columbus Hall	H. P. Croft	Industrial Uses of Copper Alloys
Worcester	March 9	Sanford Riley Hall, Worcester Tech.		Selection of Plastics for Engineering Applications
York	March 9	Lancaster, Pa.	E. M. Wise	Nickel and Nickel Alloys

A. S. M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad, Received During the Past Month

Prepared in the Library of Battelle Memorial Institute, Columbus, Ohio
Ralph H. Hopp, Librarian *W. W. Howell, Technical Abstractor*



1

ORE BENEFICIATION and RESERVES

1A—General

1A-1. Notes on the Treatment of Pyrites Cinders at the Plant of the Pyrites Co., Inc., Wilmington, Delaware. R. C. Trumbull, W. Hardiek, and E. G. Lawford. *Bulletin of the Institution of Mining and Metallurgy,* Dec. 1948, p. 1-31.

Treatment of the roasting residues from Rio Tinto cupriferous pyrites. These residues contained 56-60% Fe; substantial amounts of Cu, Pb, and Zn; also some gold and silver. Chemistry of the various steps involved. Appendix describes and diagrams venturi-type solution heater.

1A-2. An Analysis: How to Improve the Metal Supply Situation. W. B. Griffin. *Modern Metals,* v. 4, Dec. 1948, p. 20-27.

Analysis of the situation existing with regard to each of the important metals; suggestions for conservation of scarce metals by substitution of others.

1A-3. A Mineral Policy for United States. Elmer W. Pehrson. *Metals,* v. 19, Dec. 1948, p. 9-10. Also *Mining and Metallurgical Society of America, Bulletin,* v. 41, Dec. 1948, p. 57-70; discussion, p. 70-76.

Recommended Course of Action.

1A-4. Beneficiation of Industrial Minerals by Heavy-Media Separation. G. B. Welker and C. F. Allen. *Mining Engineering,* v. 1, sec. 3, Jan. 1949, p. 17-26.

Advantages, scope, operations, applications, and equipment.

1A-5. Influence of Gases Liberated From Solution on Flotation of Minerals. (In Russian.) V. I. Klassen. *Zhurnal Fizicheskoi Khimii* (Journal of Physical Chemistry), v. 22, Aug. 1948, p. 991-998.

Basic conditions characterizing liberation of air from flotation suspensions. The possibility of direct flotation of minerals by air evolving from the solution is theoretically established. 17 ref.

1A-6. Crushing and Grinding. Lincoln T. Work. *Industrial and Engineering Chemistry,* v. 41, Jan. 1949, p. 21-22.

Reviews 1948 literature. 19 ref.

1A-7. Flotation. J. Bruce Clemmer. *Industrial and Engineering Chemistry,* v. 41, Jan. 1949, p. 41-44.

Reviews 1948 literature. 49 ref.

1A-8. Mineral Position of ECA Nations. No. 10. Great Britain. Frederick R. Brewster. **No. 11. Greece.** O. Perry Riker. *Engineering and Mining Journal,* v. 150, Jan. 1949, p. 61-66.

Continues series. (To be concluded.)

1B—Ferrous

1B-1. Southern California Iron Mine in Production. *Western Machinery and Steel World,* v. 39, Dec. 1948, p. 99-100.

Development of Eagle Mountain iron ore for use by Kaiser's Fontana plant.

1B-2. Hills of Hematite. Ralph Vaill. *Iron Age,* v. 162, Dec. 16, 1948, p. 80-85.

The first of three articles on the iron ore of Minas Gerais, Brazil, submits a possible answer to the iron-ore dilemma. Located only 12 hr. from the ocean, the ore of Minas Gerais is of a composition and quality unexcelled in the world, all of it higher grade than the ore of the U.S.

1B-3. South Africa Seen as Best Source for Strategic Manganese Ores. Steve Smoke. *Iron Age,* v. 162, Dec. 16, 1948, p. 133-134.

Resources and facilities for their utilization. Brazilian resources.

1B-4. The Mesabi Taconite Problem. H. U. Ross. *Canadian Mining Journal,* v. 69, Dec. 1948, p. 57-61.

Mining and concentration problems.

1B-5. Hills of Hematite. Ralph Vaill. *Iron Age,* v. 162, Dec. 23, 1948, p. 64-68; Dec. 30, 1948, p. 34-40.

The second article on the iron ores of Minas Gerais, Brazil. Time does not permit the retreat of the U. S. steel industry to the seaboard. Problems that must be surmounted to reach the Brazilian ore, largely political. Predicts that no source of iron ore for the U. S. will ever be as cheap as the Mesabi ores, because of shipping costs. High quality may be the controlling factor, as indicated by experience of a Brazilian mill in making cold-rolled strip of superior quality from this ore.

1B-6. U. S. Steel Has Proven Huge Iron Ore Deposit in Venezuela. Tom Campbell. *Iron Age,* v. 162, Dec. 30, 1948, p. 71-72.

New reserves of several hundred million tons of hematite of 62-69% Fe content. Problems involved in exploitation. New Canadian reserves.

1B-7. The Iron Ore Shortage. Real or Fancied? Dan Reebel. *Steel,* v. 124, Jan. 3, 1949, p. 135-137.

An analysis of the factors involved indicates that steelmakers will not be wanting for good-quality ore at any time in the foreseeable future.

1B-8. Preparation of Mesabi Ore for a 2000-Ton Per Day Blast Furnace. S. Naismith. *Blast Furnace and Steel Plant,* v. 36, Dec. 1948, p. 1476-1479.

Results of a test program in which beneficiated and run-of-mine ores were charged to identical blast furnaces. Economic feasibility of general application of structure beneficiation of the ores.

1B-9. Iron Ore. W. A. Lloyd. *Iron Age,* v. 163, Jan. 6, 1949, p. 228-234, 237-239.

Future possibilities as to replacement of the fast-disappearing Mesabi ores.

1B-10. Raw Materials Problems in Birmingham. R. E. Garrett. *American Iron and Steel Institute,* 1948, 9 pages.

Properties of the ores, the limestone and dolomites, and the coals available.

1B-11. Raw Materials Problems of the Intermountain and West Coast Areas. Walther Mathesius. *American Iron and Steel Institute,* 1948, 14 pages.

Raw materials problems as applied to the iron and steel industry. Available resources of these regions.

1B-12. Investigation of Iron Ore Reserves of Iron County, Utah. Paul T. Allsman. *Skillings' Mining Review,* v. 37, Jan. 15, 1949, p. 1-2. Reprinted from *Bureau of Mines,* Report of Investigations 4388.

1B-13—(Book). **Iron Ore Resources of California.** Olaf P. Jenkins, editor. 304 pages plus 25 inserts. California Division of Mines, Ferry Bldg., San Francisco, Calif.

Thirteen separate papers describing iron ore occurrences in as many different areas in California. Additional papers contain a summary of the iron ore situation in the state and a summary of the investigations of the deposits.

1C—Nonferrous

1C-1. High Recovery Made on Unclassified Coarse Product Using Center or Side Draw-Off on Denver Selective Mineral Jig. Robert E. Lintner. *Deco Trefoil,* v. 12, Nov.-Dec. 1948, p. 4.

Operation in which a 6% lead unclassified —¾-in. feed produces a total Pb recovery of 96.9%.

1C-2. Custom Milling: American Zinc, Lead and Smelting Company, Ouray, Colorado. D. C. McLean, Hildreth Frost, Jr., and M. L. Kay. *Deco Trefoil,* v. 12, Nov.-Dec. 1948, p. 5-12.

Equipment and procedures; flow diagram.

1C-3. Minerals for Chemical and Allied Industries. A Review of Sources, Uses and Specifications. Part XXVII. Sydney J. Johnstone. *Industrial Chemist*

and Chemical Manufacturer, v. 24, Dec. 1948, p. 831-838.

Deals with tungsten and its compounds. (To be continued.)

1C-4. Recent Improvements in Milling Practice at Wright-Hargreaves. Malcolm Black. *Canadian Mining and Metallurgical Bulletin,* v. 41, Dec. 1948, p. 667-673. (*Transactions of the Canadian Institute of Mining and Metallurgy,* v. 51, p. 286-292.)

Changes in equipment and procedures for thickening, flotation, control of mill froth, and clarification at gold-refining mill.

1D—Light Metals

1D-1. The Ammonium Sulphate Process for the Extraction of Alumina From Clay and Its Application in a Plant at Salem, Oregon. W. R. Seyfried. *Metals Technology,* v. 15, Dec. 1948, TP 2473, 12 pages.

It is the opinion of the Chemical Construction Corp. that the process is workable and capable of producing high-purity alumina from almost any clay or bauxite with few, if any, limitations as to chemical analysis or physical conditions of the raw material. 33 ref.

For additional annotations indexed in other sections, see:
10A-7

2 SMELTING, REDUCTION and REFINING

2A—General

2A-1. The Problems of Heat Conductivity in Solids. III. (In Russian.) V. S. Pushkin. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 18, Aug. 1948, p. 1044-1050.

Proposes a new theory of melting and attempts to interpret it mathematically as a function of a space-time system of coordinates. The analytical-empirical method formerly used and the theoretical method proposed by the author are compared.

2A-2. Melting and Refining Fluxes; Properties, Purposes and Effects of Modern Reducing Agents. E. R. Thews. *Metal Industry,* v. 73, Dec. 24, 1948, p. 511-513; Dec. 31, 1948, p. 523-525.

Refining of scrap or virgin metal.

2B—Ferrous

2B-1. Use of Oxygen for Decarburization and Melting in the Electric Furnace. J. H. Eisaman. *Industrial Heating,* v. 15, Dec. 1948, p. 2120, 2122, 2124. A condensation.

Previously abstracted from *American Iron and Steel Institute, Preprint,* 1948, item 2b-128, 1948.

2B-2. Quality Control in the Open Hearth. Part I: Problems From Sulfur in the Open Hearth. Frank G. Norris. *Industrial Heating,* v. 15, Dec. 1948, p. 2126, 2128, 2130.

Reviews paper by L. R. Berner presented at 31st annual meeting of the Open Hearth Steel Committee of the AIME.

2B-3. Production of Electric Arc Furnace Steel. Walter M. Farnsworth. *Steel,* v. 123, Dec. 20, 1948, p. 96, 98, 101, 103, 106, 108; Dec. 27, 1948. p. 76, 78, 80, 82, 84, 86, 88.

Equipment and procedures. (Part I of the first of a series of 27 articles on making and fabrication of steel.)

2B-4. Research on Gas Mixtures; Some Substitutes in Continental Steel Making. *Chemical Age,* v. 59, Dec. 4, 1948, p. 753-754.

Recent work.

2B-5. Oxygen in Manufacturing Electric Furnace Steel. *Journal of Metals,* v. 1, sec. 1, Jan. 1949, p. 10-12.

Summarizes paper by J. H. Eisaman, presented at May 1948 meeting of AISI; as well as additional information for both basic and acid practice, reported at the 1948 Electric Furnace Steel Conference of AIME.

2B-6. The Interaction of Liquid Steel With Ladle Refractories. Carl B. Post and George V. Luerssen. *Journal of Metals,* v. 1, sec. 3, Jan. 1949, p. 15-26.

Step-down data and operating conditions for two grades of SAE steels. If furnace, ladle, and pit practices are kept reasonably constant, there is a relationship between Mn and Si ratio in the two grades of steel and the resulting cleanness. Performance records of a new deep hardening roller-bearing steel in which the Si content is adjusted to balance the high Mn content. Chemical analysis of many heats of steel and of the corresponding slag-buttons and slag-patches from the sides of ingots. Equilibrium between silicate slags containing FeO and MnO and molten steel containing Mn, Si, and FeO in solution.

2B-7. The Influence of Temperature on the Affinity of Sulphur for Copper, Manganese, and Iron. E. M. Cox, M. C. Bachelder, N. H. Nachtrieb, and A. S. Skapski. *Journal of Metals,* v. 1, sec. 3, Jan. 1949, p. 27-31.

Equilibrium constants of the reactions of FeS, MnS, and Cu_2S with H_2 were measured over a range of temperature wide enough to establish dependence of these constants on temperature. Equilibrium pressures of S_2 over the respective sulphides and free energy of their formation were calculated. It is concluded that metallic copper present in scrap will pick up sulphur from the openhearth gases.

2B-8. Factors Affecting the Quality of Rimming Steel Ingots. John A. Warchol. *Blast Furnace and Steel Plant,* v. 36, Dec. 1948, p. 1461-1462, 1469.

Recommended procedures.

2B-9. Open Hearth Charge and Feed Oxides. Barney D. McCarthy. *Blast Furnace and Steel Plant,* v. 36, Dec. 1948, p. 1475, 1512-1513.

Characteristics of ideal basic open-hearth and electric-furnace iron ores (charge oxides). Ore blocks made from Mt. Hope magnetite concentrates; their properties and superior characteristics.

2B-10. Evolution in Steelmaking. J. D. Knox. *Steel,* v. 124, Jan. 3, 1949, p. 140-142.

Recent developments.

2B-11. Appleby-Frodingham; Open-Hearth Furnaces and Other Developments. *Iron and Steel,* v. 21, Dec. 1948, p. 607-610.

Facilities of British firm, with emphasis on melting and ingot casting.

2B-12. Blast Furnace Pig Iron; American Classification and Grading Schemes. J. E. Hurst. *Iron and Steel,* v. 21, Dec. 1948, p. 611-613. Condensed from Section I. Steel Products Manual. American Iron & Steel Institute (Pig Iron and Ferro Alloys).

Includes section on sampling of pig iron.

2B-13. Steel Capacity. G. F. Sullivan. *Iron Age,* v. 163, Jan. 6, 1949, p. 198-205.

U. S. steelmaking potential was increased 2,350,000 tons in 1948 by a combination of new melting equipment and technological improvements. An additional 2,744,000 tons will be available by 1950. New facilities and new production ideas.

2B-14. Pig Iron. T. G. Johnston. *American Iron and Steel Institute,* 1948, 6 pages.

History, manufacture, use, and what has been accomplished with respect to standardization.

2B-15. The Effect of Raw Materials on Steelmaking. K. L. Fetters, E. G. Hill, H. C. Smith, and C. H. Herty, Jr. *American Iron and Steel Institute,* 1948, 10 pages.

Product requirements and steelmaking processes; requirements of ore, coke, limestone, pig iron, scrap, fuel gas or oil, and refractories for most satisfactory results.

2B-16. La fase "fossa" nel ciclo di fabbricazione dell'acciaio. (Importance of Ingot Casting in Steel Production.) Guido Calbiani. *La Metallurgia Italiana,* v. 40, Sept.-Oct. 1948, p. 177-187.

Influence of the method of casting on quality of the product. Factors involved, such as size of ingots, rate of cooling, composition of molds.

2B-17. 15-Minute Pig Iron. Les Morrow. *Canadian Metals and Metallurgical Industries,* v. 12, Jan. 1949, p. 14-16, 26.

Special electrically operated unit. Portable and semi-portable plants are to be installed at ore beds for the reduction of ore to pig iron. The present plant has a capacity of 500 lb. per hr. and is strictly a demonstration unit. Raw ore is fed into a hopper, crushed, screened, pulverized, classified, weighed, mixed, and briquetted. The preheated briquets are reduced to semi-steel or high-grade pig iron in the reduction furnace. If further refining is desired, the melt is transferred to the compounding furnace and there finished to steel.

2C—Nonferrous

2C-1. Degassing Nonferrous Metals. (Concluded.) E. Kurzinski. *Foundry,* v. 77, Jan. 1949, p. 88-91, 232-233.

Above practice, as applied to copper and various grades of copper-base alloys.

2C-2. The Scope for Saving in the Smelting and Extraction Side of the Non-Ferrous Industry. Stanley Robson. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 71-74; discussion, p. 74-76.

Discusses the above from the British viewpoint.

2C-3. The Morenci Smelter of Phelps Dodge Corporation at Morenci, Arizona. L. L. McDaniel. *Journal of Metals,* v. 1, sec. 3, Jan. 1949, p. 1-14.

The copper smelter, its mode of operation and equipment. The metallurgy of direct smelting; diagrams showing general plan of the works, arrangement of equipment, flowsheet, details of furnace construction.

2C-4. Uber die Beeinflussung der Kieselsäure-Reduktion bei der aluminothermischen Herstellung von Mangan. (The Effect of the Reduction of Silicic Acid on the Aluminothermic Production of Manganese.) Kurt Giesen

and Wilhelm Dautzenberg. *Metallforschung,* v. 2, Dec. 1947, p. 355-362.

Experiments on the reduction of a highly siliceous pyrolusite. The possibility of limiting the reduction of silica by use of different additives, thus preventing contamination of Mn by Si.

2D—Light Metals

2D-1. The Production of Lithium Metal. R. R. Rogers and G. E. Viens. *Canadian Mining and Metallurgical Bulletin,* v. 41 (*Transactions,* v. 51), Nov. 1948, p. 623-628.

Properties and history of development. Experiments in which lithium alloys of Pb, Zn, Al, Mg, and Cu-Al were produced by electrolysis of a fused mixture of LiCl and KCl. In other experiments, pure Li was produced from the Pb-Li and Cu-Al-Li alloys by low-pressure distillation, and the corrosion resistance of several of the alloys was measured under various conditions. These preliminary experiments indicate commercial feasibility of the methods and superior corrosion resistance of the alloys.

2D-2. Modern Aluminum Cells. F. C. Frary. *Chemical Engineering,* v. 55, Dec. 1948, p. 123.

See abstract from *Journal of the Electrochemical Society,* item 2b-18, 1948.

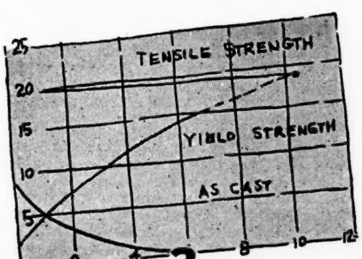
2D-3. Verhalten einiger Fremdoxyde in der technischen Aluminium-Elektrolyse. (The Behavior of Several Oxide Impurities in the Industrial Electrolysis of Aluminum.) Joachim W. Fischer. *Angewandte Chemie,* sec. B, v. 20, Jan.-Feb. 1948, p. 17-23.

Results of systematic investigation of the effects of Na_2O, BeO, MgO, CaO, TiO_2, V_2O_5, Cr_2O_3, Mn_2O_3, Fe_2O_3, CuO, ZnO, and Ga_2O_3. Considerable information on the physicochemical reactions taking place during the process of electrolysis was thus obtained. 13 ref.

2D-4. Zur Frage der Gewinnung von Magnesium und Aluminium durch thermische Reduktion ihrer Chloride mit Wasserstoff. (The Problem of Production of Magnesium and Aluminum by Thermal Reduction of Their Chlorides With Hydrogen.) Oswald Kubaschewski. *Zeitschrift fur Metallkunde,* v. 39, Jan. 1948, p. 18-22.

The feasibility of the above was investigated on the basis of thermodynamic properties.

For additional annotations indexed in other sections, see:
25C-2



3

PROPERTIES

3A—General

3A-1. Change in Hardness of a Metal Bar Under Low Cycles of Reversed and Pulsating Plastic Bending. Harry Majors, Jr. *ASTM Bulletin,* Dec. 1948, p. 39-43.

Effects of pulsating and reversed bending tests at low numbers of cycles of bending on the hardness of annealed Cu-Zn alloy and SAE 1112 annealed steel. Hardness increased with the number of cycles of bending, and no fiber had its original hardness after plastic deformation.

3A-2. Ferromagnetism. Edmund C. Stoner. *Reports on Progress in Physics,* v. 11, 1946-1947, p. 43-112.

General ideas and principles in development of theory. Theoretical and experimental work connected with intrinsic magnetization and its variation with field and temperature. 121 ref.

3A-3. Quantitative Treatment of the Creep of Metals by Dislocation and Rate-Process Theories. A. S. Nowick and E. S. Machlin. *National Advisory Committee for Aeronautics,* Report No. 845, 1946, 10 pages.

An equation for the steady-state rate of creep is derived by applying the theory of dislocations to the creep of pure metals. The form of this equation is in agreement with empirical equations describing creep rates. The theory was also used to predict the dependence of steady-state rate of creep on physical constants. Good agreement with literature data for pure annealed metals was obtained.

3A-4. The Physics of Metals. John C. Slater. *Physics Today,* v. 2, Jan. 1949, p. 6-13.

Proceedings of conference on metals of the International Union of Pure and Applied Physics, Amsterdam, July 1948.

3A-5. Strength of Metals. W. A. Wood and W. A. Rachinger. *Nature,* v. 162, Dec. 4, 1948, p. 891-892.

Progressive deformation of an annealed metal breaks down the grains into smaller crystallites which have a minimum size characteristic of the metal. Measurements of this limiting size were made for the body-centered cubic metals, Fe, Ta, Mo, and W, by an improved X-ray diffraction technique. The values thus obtained were related to maximum tensile strengths.

3A-6. Law of Eötvös and Surface Concentration of the Thermal Capacity of an Electron Gas. (In Russian.) A. Kh. Breger. *Zhurnal Fizicheskoi Khimii* (Journal of Physical Chemistry), v. 22, Aug. 1948, p. 920-924.

Temperature dependence of surface concentration on energy of the electron gas was established. The relationship of the surface tension of metals on their temperature is defined, at a sufficiently low temperature, by a quadratic function, in contrast with the law of Eötvös. Indicates that the theory of the surface concentration of thermal capacity, proposed by the author, is applicable to metals. 18 ref.

3A-7. Conditions of Formation of Plastic Deformation in Bodies of Simple Form, Rapidly Cooled at Their Surfaces. (In Russian.) B. N. Finkelshtein. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 18, Aug. 1948, p. 1026-1028.

Proposes formulas for determination of the above conditions, which result in residual stresses. Proposed equations are analyzed.

3A-8. Vapor Pressure Data for Various Substances (A Graphical Presentation). R. R. Law. *Review of Scientific Instruments,* v. 19, Dec. 1948, p. 920-922.

Data for 36 substances commonly encountered in the field of electronics and high-vacuum research. Includes a series of metallic elements.

3A-9. Comportement d 'un fil aluminium-acier constitutif d 'une ligne de contact apres 175,000 passages de frotteurs. (Condition of a Steel-Reinforced Aluminum Trolley Wire After 175,000 Passages of the Friction Contact.) Louis Albert. *Revue de l'aluminium,* v. 25, Nov. 1948, p. 339-342.

The wire consists mainly of aluminum, but has an interlocked steel section along the bottom where contact with the trolley is made. The amount of wear as compared with copper cable was investigated. Influence of cable design, composition of the aluminum, and other factors on cable life.

3A-10. Deformation of Metals in Static and in Sliding Contact. A. J. W. Moore. *Proceedings of the Royal Society,* ser. A, v. 195, Dec. 7, 1948, p. 231-244.

Examinations of the depression in a copper surface made by a cylindrical indenter and by a hemispherical slider were made in presence and absence of a lubricant. Detailed examination of the surface damage produced during sliding shows that metallic junctions are formed and sheared during the sliding process, even when sliding speeds are so small that the temperature rise due to frictional heating is negligible. It is suggested that they are produced by cold welding of the surfaces. 22 ref.

3A-11. Stress and Strain States in Elliptical Bulges. C. C. Chow, A. W. Dana, and G. Sachs. *Journal of Metals,* v. 1, sec. 3, Jan. 1949, p. 49-58.

Strain state and curvatures exhibited by three bulge shapes, one circular and two elliptical, were analyzed experimentally using cartridge-brass sheet. An attempt is made to derive stress-strain relations for these bulges, which represent strain states in which the ratio of the two positive principal strains varies between 1.0 and 0.35. In addition, tension tests gave data for a value of —0.5 for this ratio. 21 ref.

3A-12. X-Ray Line Broadening in Cold-Worked Metals. M. S. Paterson and E. Orowan. *Nature,* v. 162, Dec. 25, 1948, p. 991-992.

The above approaches a limiting value as the amount of deformation increases. A possible cause is self-annealing. Since self-annealing must be insignificant at the temperature of liquid nitrogen, the limit ought to be very much higher or absent in metals cold worked at this temperature if due to thermal recovery or recrystallization. Experiments support the view that line broadening, being due to internal stresses, is limited by the fact that the shear stress cannot rise beyond the yield stress of the material.

3A-13. The Secondary Emission of Electrons by High Energy Electrons. J. G. Trump and R. J. Van de Graaff. *Physical Review,* ser. 2, v. 75, Jan. 1, 1949, p. 44-45.

The secondary emission of electrons from tungsten, steel, aluminum, and graphite was studied as a function of the energy of the bombarding primary electrons in the range from 30 to 340 kilovolts.

3A-14. Die Temperaturabhängigkeit des Elastizitätsmoduls reiner Metalle. (The Temperature Dependence of the Elasticity Modulus of Pure Metals.) Werner Köster. *Zeitschrift fur Metallkunde,* v. 39, Jan. 1948, p. 1-9.

The above was determined for 32 very pure metals from —180° C. to the melting point, or up to about 1000° C., by determining the characteristic vibration frequencies of transverse vibrating bars. 31 ref.

3A-15. Die Aushärtung von Eisen-Zink- und Kobalt-Zink-Legierungen. (The Hardenability of Iron-Zinc and Cobalt-Zinc Alloys.) Jakob Schramm and Anton Mohrnheim. *Zeitschrift fur Metallkunde*, v. 39, Mar. 1948, p. 71-78.

Results of a study of the density, hardenability, and magnetic properties of sintered and annealed Fe-Zn and Co-Zn alloys. The Fe-Zn alloys were tested for their resistance to atmospheric and water corrosion. 10 ref.

3A-16 (Book). **Plastic Deformation; Principles and Theories.** Henry H. Hausner, editor. 192 pages. 1948. Mapleton House, 5415 17th Ave., Brooklyn 4, N. Y., $8.00.

Consists of 7 related papers: "On the Mechanics of Plastic Solids," L. N. Kachanov; "Theories of Plastic Deformation," N. H. Bellaev; "Some Problems in the Theory of Plastic Deformations," A. A. Ilyushin; "Relation Between the Theory of Saint Venant-Levy-Mises and the Theory of Small Elastic-Plastic Deformations," A. A. Ilyushin; "The Theory for Small Elastic-Plastic Deformations," A. A. Ilyushin; "Plastic Deformation of Thin Plates Under Hydrostatic Pressure," Wolfe Mostow; and "Plastic Deformation of a Thin Circular Plate Under Pressure," A. N. Gleyzal. The first five are free translations from the Russian periodical literature (1937-1946). The last two are reproduced from 1946 reports prepared for the U. S. Navy Bureau of Ships, Underwater Research Group; and David W. Taylor Model Basin; respectively. All are highly mathematical, although some experimental data are included.

3B—Ferrous

3B-1. Effect of Composition on Low-Carbon Austenitic Chromium-Nickel Stainless Steels. (Concluded.) George C. Kiefer and Claude M. Sheridan. *Industrial Heating*, v. 15, Dec. 1948, p. 2090, 2092, 2096. A condensation.

Previously abstracted from *American Iron and Steel Institute Preprint*, 1948. See item 3b-86, 1948.

3B-2. Low-Temperature Properties of 18-8 Chrome-Nickel Steels. *Steel*, v. 123, Dec. 20, 1948, p. 82-83, 119.

Data compiled by the National Bureau of Standards.

3B-3. The Problem of the Increase in Fatigue Limit Caused by Surface Shot Peening. (In Russian.) S. I. Ratner and I. I. Zakharov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1241-1246.

Proposes an explanation of the mechanism of the above. Experimental data show the validity of the theory proposed. 10 ref.

3B-4. Fourth Report of the Research Committee on High-Duty Cast Irons for General Engineering Purposes: Acicular Cast Irons. J. G. Pearce. *Institution of Mechanical Engineers, Proceedings*, v. 158, Dec. 1948, p. 327-333; discussion, p. 333-335.

Results obtained in the laboratories and experimental foundry of the British Cast Iron Research Association, in some cases by crucible melting and in others by cupola melting. Recommendations for desirable composition ranges.

3B-5. Effect of Temperature of Cold Rolling, Temperature of Testing and Rate of Pulling on Tensile Properties of Austenitic Stainless Steels With Low Nickel Content. R. A. Lincoln and W. H. Mather. *American Iron and Steel Institute*, 1948, 22 pages; discussion, p. 17-22.

Deals with alloys containing approximately 18% Cr and a little less than 7% Ni. Includes extended discussion by D. C. Buck.

3B-6. The Effect of Incidental Elements on Carbon Steel Plates. J. G. Althouse. *American Iron and Steel Institute*, 1948, 30 pages.

The point at which the residual elements, individually or collectively, change the general characteristics of plain carbon steel sufficiently to be considered significant has never been definitely determined. A cooperative investigation of the subject was therefore initiated. Nine major steel companies furnished test pieces and made determinations on 145 different heats of steel having both high and low incidental-element contents. Results of mechanical tests.

3B-7. Further Postwar Tool Steel Developments. Robert A. Cary. *Tool & Die Journal*, v. 14, Jan. 1949, p. 56-58, 60.

Further experiences with Vanadium-Alloys Steel Co.'s "Speed-Cut" (a free-machining, medium-carbon, alloy die steel) and Vasco Supreme, an alloy possessing high wear resistance in combination with an extremely high level of hot hardness and good edge strength. It is a tungsten high speed steel with 1½% C, 5% V, and 5% Co. Miscellaneous applications.

3B-8. A Metallurgical Investigation of a Contour-Forged Disc of EME Alloy. E. E. Reynolds, J. W. Freeman, and A. E. White. *National Advisory Committee for Aeronautics*, Technical Note No. 1534, Nov. 1948, 30 pages.

Properties of EME alloy (Fe base, 19 Cr, 12 Ni, 3 W, 1 Cb) in the form of contour-forged discs for the rotors of gas turbines were studied at room temperature and 1200° F. Results are compared with data from other laboratories.

3B-9. Influence of Fine Cracks on the Mechanical Properties of Stainless Chromium Steel. (In Russian.) V. I. Smirnov and N. S. Orlova. *Kotloturbostroenie* (Boiler and Turbine Manufacture), July-Aug. 1948, p. 21-23.

Results of experiment show that, in the case of coincidence of the direction of fine cracks with the direction of prevailing stresses, the influence is insignificant. If the directions do not coincide, a considerable decrease in plasticity is observed. Fine cracks do not decrease the corrosion resistance of the above steel in supersaturated steam.

3B-10. Irreversible Magnetic Effects of Stress. William Fuller Brown, Jr. *Physical Review*, ser. 2, v. 75, Jan. 1, 1949, p. 147-154.

Theoretical formulas are derived for the behavior of a soft iron or steel specimen which is first put into a state of normal magnetization and then subjected to a small tension cycle. Experimental results verified the theoretical predictions. Certain effects of diminishing alternating fields and stresses are analyzed quantitatively.

3B-11. Magnetic Domain Patterns on Single Crystals of Silicon Iron. H. J. Williams, R. M. Bozorth, and W. Shockley. *Physical Review*, ser. 2, v. 75, Jan. 1, 1949, p. 155-178.

Magnetic powder patterns were obtained on electrolytically polished surfaces of single crystals of iron containing 3.8% Si. Domains were easily visible. Several techniques were developed that enable the direction of magnetization in each domain to be determined. Many types of domain patterns were observed. 18 ref.

3B-12. A Simple Domain Structure in an Iron Crystal Showing a Direct Correlation With the Magnetization. H. J. Williams and W. Shockley. *Physical Review*, ser. 2, v. 75, Jan. 1, 1949, p. 178-183.

A hollow rectangle cut from a single crystal of 3.8% Si iron was studied with the aid of powder patterns and flux measurements. The domain pattern consisted of eight domains, four forming an inner rectangle magnetized in one direction and the others forming an oppositely magnetized outer rectangle. Changes in magnetization occur by the growth of one set of domains at the expense of the other. Implications in connection with Barkhausen effect, and a method of measuring the energy of the Bloch wall.

3C—Nonferrous

3C-1. Delayed Fracture of Materials Under Tension, Torsion and Compression. C. Gurney and Z. Borysowski. *Proceedings of the Physical Society*, v. 61, Nov. 1, 1948, p. 446-452.

The materials tested were brass in ammonia vapor, polymerized methyl methacrylate in liquid CCl_4, and glass in air. Delayed fracture is attributed to the gradual spread of cracks caused by preferential attack by the surrounding medium of the highly stressed material at the ends of the cracks. In no case did delayed fracture occur in compression.

3C-2. Machinery's Data Sheets 625 and 626. Classifications and Compositions of Copper-Base Ingot Alloys. Physical Properties of Copper-Base Ingot Alloys. *Machinery* (American), v. 55, Jan. 1949, p. 245.

3C-3. Surface Effects with Single Crystal Wires of Cadmium. E. N. Da C. Andrade and R. F. Y. Randall. *Nature*, v. 162, Dec. 4, 1948, p. 890-891.

Results of some experiments on the effects of salt contamination on hardening and flow properties. If a single crystal with a clean surface is loaded so that it flows very slowly (at a rate of about 1% per hour), immersion in commercial cadmium plating solution (which contains potassium cyanide, cadmium potassium cyanide, sodium carbonate and sodium hydroxide) leads to an immediate increase of rate of flow, which may be anything up to twenty-fold. The fact that the effect is immediate seems to indicate that it is not caused by diffusion from the surface.

3C-4. The Superconductive Transition. C. K. C. MacDonald and K. Mendelssohn. *Nature*, v. 162, Dec. 11, 1948, p. 924.

Experimental results on very pure lead. No evidence was found (once the disturbing effect of geometrical shape is removed) for the theory that either discontinuous change of resistance or hysteresis are characteristic attributes of superconductive transition in a magnetic field.

3C-5. Determination of the Zero Point of Solid Metals on the Basis of Results of Measurement of the Capacity of the Double Layer. Lead. (In Russian.) A. Frumkin. *Zhurnal Fizicheskoi Khimii* (Journal of Physical Chemistry), v. 22, Aug. 1948, p. 925-929.

Attempts to apply the method of measuring the capacity in dilute solutions for the determination of the zero point of charge for solid metals. This point for lead was found to be —0.97 volts. 12 ref.

3C-6. Uber eine Sondererscheinung im Temperaturgang von Elastizitätsmodul und Dämpfung der Metalle Kupfer, Silber, Aluminium und Magnesium. (An Unusual Deviation in the Temperature Curve of the Modulus of

Elasticity and Damping of the Metals Copper, Silver, Aluminum, and Magnesium.) Werner Köster. *Zeitschrift fur Metallkunde,* v. 39, Jan. 1948, p. 9-12.

The above metals show an unexpected lowering of the elasticity modulus and an increase in damping over a fairly wide temperature range. The amount of deflection depends on the purity of the metals. Deoxidation or addition of deoxidizing elements eliminates these effects in copper and silver. The phenomenon is explained by the diffusion of foreign atoms in solution.

3C-7. Eigenschaften und Zustand galvanisch abgeschiedener Metalle mit höherem Gehalt an nichtmetallischen Fremdstoffen. (Properties and Condition of Electrolytically Produced Metals Having High Contents of Non-Metallic Impurities.) Ernst Raub. *Zeitschrift fur Metallkunde,* v. 39, Feb. 1948, p. 33-44.

The effect of nonmetallic inclusions on the properties of electrolytically produced Ag and Cu and effects of heat treating. Includes X-ray diffraction patterns and photomicrographs. 14 ref.

3C-8. Der Magnetisierungsvorgang bei einer Eisen-Nickel-Aluminium-Kobalt-Kupfer-Magnetlegierung mit Vorzugsrichtung. (The Magnetization Process in an Iron-Nickel-Aluminum-Cobalt-Copper Magnet Alloy With Preferred Orientation.) Werner Jellinghaus. *Zeitschrift fur Metallkunde,* v. 39, Feb. 1948, p. 52-56.

Specimens of the alloy were heated for 15 min. at 950° C. and cooled in a magnetic field. Magnetization, hysteresis, and apparent-remanence curves.

3C-9. Diagramma di durezza di un metallo. (Diagram of the Hardness of a Metal.) Vincenzo Montoro. *La Metallurgia Italiana,* v. 40, Sept.-Oct. 1948, p. 173-175.

Possibility of determining the influence of stress on the microhardness of metals. Investigations on electrolytic copper, a Cu alloy (38.8% Cu, 61.2% Sn), and a remelted Al alloy showed a certain relationship between these two factors which may be expressed by an empirical formula.

3C-10. Uber das Kontaktrauschen. (Concerning Contact Noise.) Wilhelm Rump. *Metallforschung,* v. 2, May 1947, p. 138-144.

Causes of noises caused by uneven or defective contacts and by the opening and closing of electrical circuits. Observations on the behavior of gold, silver, platinum, tungsten, nickel, and alloys of noble metals with each other and with base metals with respect to noise.

3C-11. The Constitution and Properties of Alloys Containing Tantalum and Columbium. Rupert H. Myers. *Metallurgia,* v. 39, Dec. 1948, p. 57-63.

Supplement to an earlier paper, which reviewed literature on chemistry and metallurgy. Information which is available on alloys containing these metals. 67 ref.

3C-12. A Calculation of the Changes in the Conductivity of Metals Produced by Cold Work. J. S. Koehler. *Physical Review,* ser. 2, v. 75, Jan. 1, 1949, p. 106-117.

The increase in the electrical resistance of severely cold worked metals was calculated by assuming that the important change which occurs during cold work is the introduction of large numbers of Taylor dislocations. The calculated increase for polycrystalline copper was in good agreement with the measured value. For single crystals, there is a decided dependence of the dislocation resistance on the orientation of the electric field relative to the crystallographic axes.

3C-13. Magnetic Susceptibility of Zinc at Liquid Helium Temperatures. S. G. Sydoriak and J. E. Robinson. *Physical Review,* ser. 2, v. 75, Jan. 1, 1949, p. 118-131.

The de Haas-van Alphen effect in zinc was investigated at 4.2° K. by measuring the couple on a zinc crystal in a uniform magnetic field. Data obtained give the dependence of the susceptibility both on field strength and on orientation relative to the direction of the field. Results agree qualitatively with the theory of Blackman and Landau. Comparison of results with those of Marcus on zinc and Shoenberg on bismuth. 17 ref.

3D—Light Metals

3D-1. Titanium—An Appraisal. Neville S. Spence. *Light Metals,* v. 11, Dec. 1948, p. 645-647.

Commercial development of the above "near" light metal. Suggests that it may develop into an active competitor, in specialized engineering fields, to aluminum and magnesium.

3D-2. Physical Properties of Titanium Alloys. *Iron Age,* v. 162, Dec. 30, 1948, p. 41-43.

Data reported at titanium symposium held recently in Washington, D. C., under the sponsorship of the Office of Naval Research. "Physical and Mechanical Properties of Commercially Pure Titanium", C. I. Bradford; "Properties of Iodide Type Titanium", F. B. Litton; "Some Preliminary Data on Alloys of Titanium", E. I. Larson, E. F. Swazy, L. S. Busch, and R. H. Freyer; "Titanium Base Alloys", H. C. Cross.

3D-3. Plastic Deformation Waves in Aluminum. Andrew W. McReynolds. *Journal of Metals,* v. 1, sec. 3, Jan. 1949, p. 32-45.

Plastic deformation of 2S aluminum and Al-Cu alloys was found to proceed according to a stair-step stress-strain curve. The same effect was observed in 70-30 alpha brass. The discontinuities were found to result from propagation of waves of plastic deformation along all or part of the specimen length. The effect was found to depend on presence of an alloying element. It does not occur in 99.99% Al. 24 ref.

3D-4. Sur l'influence de faibles traces d'impuretés et de l'écrouissage sur la variation des propriétés mécaniques de l'aluminium au cours de sa recristallisation. (Influence of Traces of Impurities and of Cold Working on the Variation of the Mechanical Properties of Aluminum During its Recrystallization.) Henri Chossat, Michel Mouflard, Paul Lacombe, and Georges Chaudron. *Comptes Rendus* (France), v. 227, Aug. 18, 1948, p. 432-433.

The above was investigated for 99.99 and 99.998% Al. Changes in physical properties depending on recrystallization temperatures are indicated.

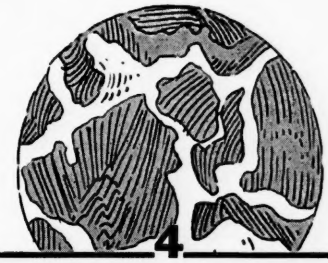
3D-5. Uber den Einfluss von Quecksilber auf die Festigkeitseigenschaften einer Magnesium-Mangan-Legierung. (Concerning the Effect of Mercury on the Strength of a Magnesium-Manganese Alloy.) Walter Bulian. *Metallforschung,* v. 2, May, 1947, p. 158-160.

Experiments with Mg alloys containing 1.8% Mn and 0.2-1.8% Hg showed that Hg does not appreciably affect tensile strengths but slightly improves resistance to corrosion. Production of the alloys is described and micrographs show the effect of Hg on alloy structures.

3D-6. The Magnetic Moment of Aluminum[27]. John R. Zimmerman and Dudley Williams. *Physical Review,* ser. 2, v. 75, Jan. 1, 1949, p. 198-199.

Preliminary results for this aluminum isotope.

For additional annotations indexed in other sections, see:
2A-1; 4C-10; 4D-1; 18B-1; 19D-8; 22B-40



4 CONSTITUTION and STRUCTURE

4A—General

4A-1. The Growth of Crystals. G. P. Thomson. *Proceedings of the Physical Society,* v. 61, Nov. 1, 1948, p. 403-416.

Fundamental mechanisms involved. 32 ref.

4A-2. Nondiffusional (Martensite) Transformations in Alloys (In Russian.) G. V. Kurdyumov. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics) v. 18, Aug. 1948, p. 999-1025.

The nature of martensite and the nature of the transformation of austenite into martensite during heat treatment as applied to ferrous metals and to copper alloys (supersaturated alpha phase). Mechanism of the transformation was studied by X-ray and micrographic methods. Illustrated by constitutional diagrams, tables, and micrographs. 50 ref.

4A-3. Ein Beitrag zur Kenntnis ternärer Phosphorlegierungen (On Ternary Phosphate Alloys.) H. Nowotny and E. Henglein. *Monatshefte fur Chemie und verwandte Teile anderer Wissenschaften,* v. 79, Oct. 1948, p. 385-393.

A study of the structures of the Cr-Mn-P, Cr-Fe-P, Cr-Ni-P, Mn-Fe-P, Mn-Ni-P, Fe-Ni-P, Cr-Cu-P, Mn-Cu-P, Fe-Cu-P, and Ni-Cu-P systems. 16 ref.

4A-4. Anwendung des Bandmodells der Elektronentheorie auf die Kristallchemie der Legierungen. II. Ein Beitrag zur Raumchemie der festen Stoffe. (Application of Electron-Theory Bond Models to the Crystal Chemistry of the Alloys. II. A Contribution to the Structural Chemistry of Solids.) Konrad Schubert. *Zeitschrift fur Metallkunde,* v. 39, Mar. 1948, p. 88-96.

Shows that it is possible to discover new relationships within metallic and nonmetallic crystal structures by means of the above. 41 ref.

4A-5. Gaz et metaux. (Gases and Metals.) (Concluded.) Henry Lepp. *Le Vide,* v. 3, July-Sept. 1948, p. 463-468.

The reaction of nitrogen with commonly used metals and oxygen gas-metal complexes. Obtained compounds and their physical and chemical characteristics. 17 ref.

4A-6. Systematization of Certain Binary Metallic Equilibrium Diagrams.

H. J. Axon. *Nature,* v. 162, Dec. 25, 1948, p. 997.

Available data on binary systems in which no intermediate compounds are formed were examined in attempt to systematize knowledge of factors which influence the form of binary equilibrium diagrams. Two types of systems were encountered: those having a region of liquid immiscibility and those having a eutectic. "Size factors" for each system were plotted against "temperature factors." This resulted in discovery of certain systematic relationships.

4A-7. (Book). **Hydrogen in Metals.** Donald P. Smith. 366 pages. 1948. University of Chicago Press, Chicago 37, Ill. $10.00.

Second of series of monographs on various aspects of the science of metals consists of a critical correlation of all significant published data relating to the physical chemistry of hydrogen-metal systems. Does not deal with industrial aspects, and such topics as adsorption and catalysis have been omitted. 1467 ref.

4A-8. (Book). **Crystal Structures. Section 1.** Ralph W. G. Wyckoff. Unpaged. 1948. Interscience Publishers, 215 Fourth Ave., New York 3, N. Y.

The first section of a loose-leaf compilation to consist of three sections. Supplements and replacement sheets will be issued from time to time to bring the material up to date. The book is divided into chapters, and in each chapter the material is subdivided into text, tables, illustrations, and bibliography.

4A-9 (Book). **Electrons, Atoms, Metals and Alloys.** William Hume-Rothery. 377 pages. 1948. Published by Louis Cassier Co., Ltd., and distributed by Iliffe & Sons, Ltd., Dorset House, Stamford St., London, S.E. 1, England. 25s. (postage, 6d.)

Intended for the non-mathematical reader. Divided into four parts dealing with structure of atoms, metals, alloys, and atomic nuclei. Presented in the form of a dialogue between an "older metallurgist" and a "young scientist," bringing out clearly the contrast between the old and new viewpoints. Although written primarily for the metallurgical reader, the book also serves as an elementary introduction to modern atomic theory.

4B—Ferrous

4B-1. The Structure at a Cleavage Surface in Ferrite. E. P. Klier and others. *Metals Technology,* v. 15, Dec. 1948, TN 8, 2 pages.

Back-reflection X-ray patterns were obtained on the cleavage facets of ferrite grains. One of these is shown.

4B-2. Binary and Ternary Interstitial Alloys. I. The Iron-Nitrogen System: the Structures of Fe_4N and Fe_2N. II. The Iron-Carbon-Nitrogen System. III. The Iron-Carbon System: the Characterization of a New Iron Carbide. K. H. Jack. *Proceedings of the Royal Society,* ser. A, v. 195, Nov. 12, 1948, p. 34-61.

In Part I, the zeta phase of Fe_2N was prepared by passing NH_3 over iron at temperatures not over 450° C. Details of structure of the various phases involved were determined by X-ray diffraction. In Part II, chemical and X-ray investigation of the reaction of CO with iron nitrides and of that of NH_3 with iron carbides disclosed existence of iron carbonitrides, a series of new ternary interstitial alloys. In Part III, the cell dimensions of "iron percarbide," which has an empirical formula of $Fe_{20}C_9$, are given. This compound is believed to be the "Fe_2C" previously thought to exist. Cementite was also prepared—by action of CO on Fe_2O_3. Both carbides are metastable, forming alpha iron and carbon. 63 ref.

4B-3. A New Carbide in Chromium Steels. H. J. Goldschmidt. *Nature,* v. 162, Nov. 27, 1948, p. 855-856.

Discovery of a phase with crystal structure identical to austenite. Phase relationships believed to exist between this and other carbides are discussed from the theoretical point of view. Possible applications to practical metallurgy.

4B-4. Recherches sur le mécanisme de la fragilité de décapage de l'acier. III. Influence d'un recuit préalable dans l'hydrogene du fer Armco sur la diffusion ultérieure a froid de ce gaz dans le métal. (Research on the Mechanism of the "Pickling Brittleness" of Steel. III. The Influence of Preliminary Annealing of Armco Iron in Hydrogen on the Subsequent Diffusion of This Gas Into the Metal at Low Temperatures.) Paul Bastien. *Revue de Métallurgie,* v. 45, Sept. 1948, p. 301-311.

Importance of hydrogen concentration in the gas layer adsorbed by iron and its release which causes brittleness. Experiments on monocrystals showed that the brittleness of the pickled monocrystals is not caused by absence of intercrystalline grain boundaries but by modification of the chemical activity of the metal itself, particularly of its surface.

4B-5. La fonte grise. Mécanisme de la solidification des fontes grises hypoeutectiques. (Gray Cast Iron. The Mechanism of Solodification of Hypoeutectic Gray Cast Iron.) (Concluded.) Henri Laplanche. *Fonderie,* Sept. 1948, p. 1299-1315.

Comparative investigation of the mechanism of solidification of synthetic alloys and the corresponding industrial alloys revealed the influence of various factors on structure and properties. 47 ref.

4B-6. The Structure of Carbides in Alloy Steels. Part I. General Survey. H. J. Goldschmidt. *Journal of the Iron and Steel Institute,* v. 160, Dec. 1948, p. 345-362.

First of a series describing X-ray work especially on high speed steels. Mainly concerned with the structures of carbides formed by Fe, Cr, W, and Mo. Carbide structures are described and an attempt is made to correlate them with stability in the presence of given elements. 93 ref.

4C—Nonferrous

4C-1. The Constitution of Tin-Rich Tin-Antimony-Copper Alloys. J. V. Harding and W. T. Pell-Walpole. *Journal of the Institute of Metals,* v. 75, Nov. 1948, p. 115-130.

The constitution of the above alloys containing up to 14% Sb with 3% Cu was determined by thermal and microscopical analysis. Structures and applications of typical cast bearing alloys of this system are correlated with the features of the equilibrium diagram.

4C-2. Studies of Silicon Carbides With the Electron Microscope. E. DeHaas and D. Lundqvist. *Applied Scientific Research,* v. B1, No. 3, 1948, p. 181-186.

As an introduction to further investigations of the surface conditions of different types of silicon carbide, a number of green and black crystals were studied by the electron microscope.

4C-3. On the Structure of Gold-Silver-Copper Alloys. John G. McMullin and John T. Norton. *Journal of Metals,* v. 1, sec. 3, Jan. 1949, p. 46-48.

Emphasis is on the two-phase region in which Cu-poor and Ag-poor phases coexist.

4C-4. A Study of Textures and Earing Behavior of Cold-Rolled (87-89 Pct) and Annealed Copper Strips. Ming-Kao Yen. *Journal of Metals,* v. 1, sec. 3, Jan. 1949, p. 59-66.

Results of experiments on five types of commercial copper, made to evaluate effects of phosphorus and some other significant impurities on the development of texture during cold reductions. 21 ref.

4C-5. Use of Electrical Resistance Measurements to Determine the Solidus of the Lead-Tin System. Ralph Hultgren. *Journal of Metals,* v. 1, sec. 3, Jan. 1949, p. 67-71.

Application of above technique, not hitherto reported in the literature. It was found to be convenient, reproducible, and highly sensitive. Compares results with those obtained by other methods by other investigators.

4C-6. Das Dreistoffsystem Gold-Kupfer-Nickel. II. Die Unwandlungen der Gold-Kupfer-Legierungen im Dreistoffsystem Gold-Kupfer-Nickel. (The Ternary System Gold-Copper-Nickel. II. Transformations of the Gold-Copper Alloys in the Ternary Gold-Copper-Nickel System.) Ernst Raub and Annemarie Engel. *Metallforschung,* v. 2, May, 1947, p. 147-158.

X-ray diffraction study of the above for AuCu-Ni and $AuCu_3$-Ni alloys with Ni contents up to 65.0 and 72.5%, respectively, after annealing at 300-400° C. Effects of cold working prior to annealing.

4C-7. Einkristalle des Monotektikums Zink-Blei. (Monocrystals of the Monoeutectic Zinc-Lead Alloy.) Wilhelm Hofmann. *Metallforschung,* v. 2, Dec. 1947, p. 383.

Shows experimentally that the frequently assumed fine-grain structure of the above refers to the dispersion of droplets, not to the simultaneously crystallized phase.

4C-8. Beitrag zur Kenntnis des Systems Zink-Chrom. (A Contribution to Knowledge Concerning the Zinc-Chromium System.) Theo Heumann. *Zeitschrift fur Metallkunde,* v. 39, Feb. 1948, p. 45-52.

Results of experiments made to determine the composition of the Zn-rich phase, its temperature of formation, and primary segregation curve; also the effect of temperature on the limit of solubility of Zn-rich solid solutions.

4C-9. Some New Ferromagnetic Manganese Alloys. F. A. Hames and D. S. Eppelsheimer. *Nature,* v. 162, Dec. 18, 1948, p. 968.

Preliminary experiments indicate that ferromagnetic phases exist in the binary systems Mn-Ge and Mn-In, and in the ternary system Cu-Mn-Ge. Investigation of these systems is being extended in order to identify the ferromagnetic carriers. It is suggested that ferromagnetic phases may exist in the Mn-Ge system.

4C-10. Magnetostriction and Order-Disorder. J. E. Goldman and R. Smolu-

chowski. *Physical Review*, ser. 2, v. 75, Jan. 1, 1949, p. 140-147.

An experimental and theoretical study of the relationship between saturation magnetostriction and the order-disorder transformation in an Fe-Co alloy. Alloys in the neighborhood of 50 atomic % composition containing 0.75% Cr were used. Measurements of both electrical resistivity and neutron diffraction were used to confirm the presence of the superlattice. 13 ref.

4D—Light Metals

4D-1. Hydrogen in Aluminum. Yves Dardel. *Metals Technology*, v. 15, Dec. 1948, TP 2484, 14 pages.

New method for determining the amount of hydrogen in liquid as well as in solid aluminum, based on bubble formation on lowering of the hydrostatic pressure above the melt. The method was also applied to a study of degassing methods and of the effect of dissolved hydrogen on properties. 20 ref.

4D-2. Magnesium Alloy Castings. N. Nicholas. *Research*, v. 1, Dec. 1948, p. 718-719.

Methods for improving mechanical properties. Method in which high-frequency current causes a predetermined reduction of grain-size and directional orientation of crystals with corresponding improvement in properties.

4D-3. Intergranular Corrosion of Pure Aluminium in Relation to the Behavior of Grain-Boundaries During Melting. G. Chaudron, P. Lacombe, and N. Yannaquis. *Nature*, v. 162, Nov. 27, 1948, p. 854-855. Translated from the French.

Chalmers showed that the grain boundaries of high-purity tin have a melting temperature lower than that of bulk tin. A similar effect was observed in the case of high-purity aluminum by use of a simple device. When the metal was heated for a long time near its melting point, an inversion of the corrosion was observed; for example, HCl only dissolved the bulk of the crystals, leaving their boundaries uncorroded, as a very thin partition.

4D-4. The Constitution of Aluminium-Manganese-Magnesium and Aluminium-Manganese-Silver Alloys, With Special Reference to Ternary-Compound Formation. D. W. Wakeman and G. V. Raynor. *Journal of the Institute of Metals*, v. 75, Nov. 1948, p. 131-150.

In connection with the role of transitional metal solutes in Al-rich alloys, experimental studies of the above systems were made. Results from the theoretical point of view. 27 ref.

4D-5. Les imperfections de structure des cristaux uniques d'aluminium pur. (Imperfections in Pure Aluminum Monocrystals.) P. Lacombe and L. Beaujard. *Revue de Métallurgie*, v. 45, Sept. 1948, p. 317-322.

Results indicate the presence of intercrystalline lines on the above, produced by recrystallization in the solid state. These lines form boundaries of small blocks, slightly disoriented, disclosed by etching and shown by photomicrographs of low magnification. The aluminum crystals do not always exhibit the phenomenon of "veining." 16 ref.

4D-6. Etude de la recristallisation de l'aluminium de haute pureté par traitements de recuit isothermes. (Study of Recrystallization of High Purity Aluminum Caused by Isothermal Annealing.) Henri Chossat, Paul Lacombe, and Georges Chaudron. *Comptes Rendus* (France), v. 227, Sept. 20, 1948, p. 593-595.

The above was investigated at temperatures of 206, 245, and 285° C. The beginning of recrystallization occurs at 20° and its end at 285° C. The relationship of the mechanical properties of pure aluminum (99.99%) to time of annealing was established for this temperature.

4D-7. Uber die Löslichkeit von Eisen, Mangan und Zirkon in Magnesium und Magnesiumlegierungen. (Concerning the Solubilities of Iron, Manganese, and Zirconium in Magnesium and Magnesium Alloys.) Gustav Siebel. *Zeitschrift fur Metallkunde*, v. 39, Jan. 1948, p. 22-27.

Results of determination of the above. Photomicrographs show crystal formation in the melts. 10 ref.

4D-8. Bemerkung zu einer Arbeit von G. Bassi: "Einfluss einer thermischen Vorbehandlung auf die Korngrosse von ausgehärteten Blechen einer Legierung der Gattung Al-Cu-Mg nach kritischer Verformung." (Remarks on Work by G. Bassi: "Effect of Thermal Pretreatment on the Grain Size of Hardened Sheets of an Al-Cu-Mg Alloy After Critical Deformation.") Karl Ludwig Dreyer. *Zeitschrift fur Metallkunde*, v. 39, Jan. 1948, p. 27-28.

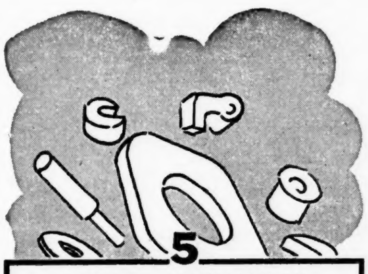
Bassi showed that coarse-grained recrystallization of an Al-Cu-Mg alloy can be avoided by suitable annealing after the homogenizing treatment. Dreyer shows experimentally that grain growth can be avoided by grain-boundary segregation, but that this effect will be absent when the metal is annealed at 500° C. before critical deformation.

4D-9. Some Experiments on the Reaction of Titanium With Oxygen and Nitrogen. L. G. Carpenter and F. R. Reavell. *Metallurgia*, v. 39, Dec. 1948, p. 63-65.

Exploratory experiments on the reaction at 700 and 1000° C., using the two gases in separate experiments under pressures corresponding to their partial pressures in air. Probabilities of reaction, under these conditions of temperature and pressure, are calculated.

For additional annotations indexed in other sections, see:

3A-5-12; 3C-11-12; 6B-10-11-12; 9-23; 10B-9; 11-12; 19D-7; 22B-32



POWDER METALLURGY

5A—General

5A-1. The Sintering of Metal Powders. Robert Talmage. *Industrial Heating*, v. 15, Dec. 1948, p. 2098, 2100, 2102, 2104, 2106, 2180-2181.

Gives an example from each of two different categories—pure metal or completely alloyed powder, and powders mixed in various percentages to produce an alloy. Importance of proper sintering times and temperatures. The great number of variables involved and the need for additional experimental work.

5A-2. Lead-Grid Study of Metal Powder Compaction. Robert Kamm, M. A. Steinberg, and John Wulff. *Metals Technology*, v. 15, Dec. 1948, TP 2487, 13 pages.

A lead-grid method is used for exploring the distribution of strain and density within metal-powder compacts. Circular-hole grids can be more accurately made and, when deformed within the powder, more readily measured and analyzed. Effect of lubrication, compact height, pressure, speed of pressing, and vacuum pressing.

5A-3. Powder Metallurgy in Japan—Post-War Developments. Kazuhiko Ogawa. *Powder Metallurgy Bulletin*, v. 3, Nov. 1948, p. 128-129.

Excerpts from a letter outline work under way and recent developments.

5A-4. Plastic Bonding of Boron Powder. L. Hays and J. E. Burke. *U. S. Atomic Energy Commission*, AECD-2279, Oct. 4, 1944, 2 pages.

Describes a method for bonding boron powder by wet-tamping with methyl methacrylate monomer and polymerizing the monomer to produce a piece which has a boron density of at least 1.6 g per cc. The method has the advantage that almost any shape can be made without constructing expensive dies or using a press. It should be possible to bond other materials in the same manner.

5A-5. Uber einige neue Verfahren der Pulvermetallurgie. (Concerning Some New Methods for Powder Metallurgy.) Gunter Wassermann. *Metallforschung*, v. 2, May, 1947, p. 129-137.

Customary methods and several new methods.

5A-6. The Influence of the Surface Structure of Individual Powder Particles in the Production of Powder Metal Components. A Discussion of Fundamental Principles. S. J. Garvin. *Murex Review*, v. 1, No. 2, 1948, p. 17-32.

5B—Ferrous

5B-1. Permanent Magnets From Pure Iron Powder. Robert Steinitz. *Powder Metallurgy Bulletin*, v. 3, Nov. 1948, p. 124-127.

This development has reached large-scale commercial application only in France. 14 ref.

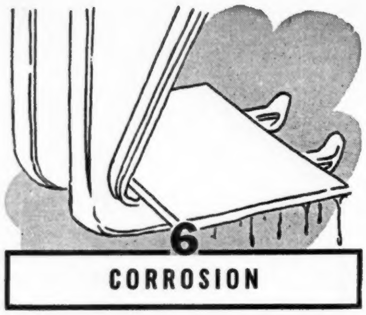
5C—Nonferrous

5C-1 (Book). Manufacture of Cemented Carbides. T. A. Hood. 153 pages. 1947. Defence Research Laboratories, Dept. of Supply and Development, Commonwealth of Australia, Maribyrnong, Victoria, Australia. (Information Circular 12.)

The production of "starting materials", such as powdered carbides and powdered metals, from raw materials is briefly described. The manufacture of cemented carbide articles from the powdered constituents, which involves milling of the powders, the pressing of compacts, and their heat treatment is dealt with in detail. The various items of plant and equipment required such as ball-mills, furnaces, molds and presses, are described; and notes on design and materials of construction are given. This is followed by a series of tables of properties, an abstracted bibliography, and author and subject indices.

For additional annotations indexed in other sections, see:

23C-1



6A—General

6A-1. Oxide Films Formed on Metals and Binary Alloys. An Electron Diffraction Study. J. W. Hickman. *Metals Technology,* v. 15, Dec. 1948, TP 2483, 18 pages.

Results of study of films formed on a series of pure metals are summarized and data on 31 binary alloys (Ti-Ni, Ti-Cu, Zr-Cu, Zr-Co, Zr-Ni, Mo-W, Mo-Ni, Mo-Co, Mo-Cr, W-Ni, W-Cr, W-Cu, Si-Fe, Cr-Fe, Ni-Cr, Be-Cu, and Cu-Ni, of various percentage ratios). It is impossible to predict the oxide that will be formed on the basis of thermodynamic stabilities or ion sizes. An empirical table in graphical form shows sums of relative rates of formation and diffusion of the several ions based on the data. 27 ref.

6A-2. Hydrochloric Acid Versus Construction Materials. *Chemical Engineering,* v. 55, Dec. 1948, p. 231-232, 234.

Part I of a symposium in which a representative group of construction materials is evaluated for services involving hydrochloric acid. Includes the following: "Stainless Steel", W. G. Renshaw; "Lead", Kempton H. Roll; "Rubber Lining", O. S. True; and "High-Silicon Irons", Walter A. Luce.

6A-3. Station Design and Material Composition As Factors in Boiler Corrosion. R. B. Donworth. *Paper Trade Journal,* v. 127, Dec. 30, 1948, p. 17-20.

The equipment in a modern power station is composed chiefly of two elements, Fe and Cu. Other elements including Zn, Cr, Mo, Ni, Mn, W, Co, Sn, P, Sb, As, Ag, and C are also present in smaller quantities. Shows physical relationship of materials and influence of design on both corrosion and erosion and the subsequent carrying of the products into the boiler.

6A-4. Plastic Coatings and Corrosion. C. G. Munger. *World Oil,* v. 128, Jan. 1949, p. 176-177, 180.

Vinyl chloride and vinyl chloride copolymer resins were evaluated as corrosion-preventive coatings. The studies are of especial value in the protection of tubular goods and tank structures.

6A-5. Zur Bedeckungstheorie der Passivität. (The Coating Theory of Passivity.) F. Halla and R. Weiner. *Korrosion und Metallschutz,* v. 21, Mar.-Apr. 1945, p. 27-32.

Attempt to show that W. J. Muller's experiments do not necessarily prove that the coating is uniformly thick over the entire area. 18 ref.

6A-6. Allgemeine Betrachtungen zur Passivität. (A General Discussion of Passivity.) K. Wickert. *Korrosion und Metallschutz,* v. 21, Mar.-Apr. 1945, p. 32-40.

The problem of the protective effect of pickling. Apparatus used to investigate anodic and cathodic passivation.

6A-7. Die Bedeckungstheorie der Passivität der Metalle. (The Coating Theory of the Passivity of Metals.) III. V. Cupr. *Korrosion and Metallschutz,* v. 21, Mar.-Apr. 1945, p. 43-44.

W. J. Muller's derivation of an equation for the above is based on Faraday's Law, and rejection of the former theory would be premature.

6A-8. Uber die Spannungs- und Temperatureabhängigkeit der Spannungskorrosion. (The Effect of Stress and Temperature on Stress Corrosion.) Gunter Wassermann. *Zeitschrift fur Metallkunde,* v. 39, Mar. 1948, p. 66-71.

The metals investigated were ferritic and austenitic steels; Al-Cu, Al-Mg, Al-Zn-Mg, and Mg-Al-Zn alloys; and brass.

6A-9. Examen systématique de l'inhibition de la corrosion. (Systematic Investigation of Corrosion Inhibition.) H. C. J. de Decker. *Métaux & Corrosion,* v. 23, Oct. 1948, p. 226-231.

The relationship among concentration of inhibitor, time of contact, composition of material, and nature of medium. Different methods of measurements and interpretation of data.

6A-10. Observations sur là tenue a la corrosion des cables électriques en aluminium-acier déposés apres 15 a 30 ans d'usage. (Observations Concerning the Corrosion of Aluminum Cable With A Galvanized Steel Core Used for High-Tension Lines After 15 to 30 Years of Service.) J. Hérenguel. *Métaux & Corrosion,* v. 23, Oct. 1948, p. 242-244.

Results indicate that life should easily exceed 50 years, without alteration of basic properties.

6A-11. Variation of Standard Electrode Potentials With Temperature. M. H. Everdell. *Nature,* v. 162, Dec. 25, 1948, p. 995-996.

The desirability in corrosion studies of being able to directly compare potentials measured at different temperatures. A theoretical analysis indicates that the potential of the standard hydrogen electrode or any other electrode does vary with temperature.

6A-12. A Study of the Corrosion Resistance of High-Alloy Steels to an Industrial Atmosphere. H. T. Shirley and J. E. Truman. *Journal of the Iron and Steel Institute,* v. 160, Dec. 1948, p. 367-375.

Tests designed to study the effects of composition and surface finish on behavior of steels when exposed for long periods to several industrial atmospheres, without the cleansing treatment normally recommended. The series included some 450 samples, covering 22 steels and 5 nonferrous materials, all in sheet form. The three types of surface finish tested were pickled, emeried, and mirror-polished. 15 ref.

6A-13. Galvanic Corrosion of Metals in Salt Water. *Metal Finishing,* v. 47, Jan. 1949, p. 73.

Table shows relative activity of 29 different commercial alloys.

6A-14 (Book). **Directory of the American Co-Ordinating Committee on Corrosion.** 62 pages. National Association of Corrosion Engineers, 905 Southern Standard Bldg., Houston, Tex. $2.00.

Names, addresses, and fields of special endeavor of many of the principal corrosion workers in the U. S. and Canada. A cross-index makes it possible to find the name and address of workers in specific phases of corrosion. Consists of four parts: a subject index; an alphabetical index of individuals; an alphabetical index of organizations and companies; and a numerical serial number listing of individuals.

6B—Ferrous

6B-1. Bone Fixation and the Corrosion Resistance of Stainless Steels to the Fluids of the Human Body. Colin G. Fink and Joseph S. Smatko. *Journal of the Electrochemical Society,* v. 94, Dec. 1948, p. 271-277.

Bone fixation plates and screws were prepared from three different stainless steels and from one Cr-Co alloy. These were tested under conditions closely duplicating those prevailing in the human body. Results showed that stainless steel, such as AISI Type 302, is the most corrosion resistant. 17 ref.

6B-2. Management Information on Cathodic Protection. *Petroleum Engineer,* v. 20, Dec. 1948, p. 262-263.

A brief outline.

6B-3. The Catalytic Oxidation of Sulphur Dioxide on Metal Surfaces. Part II. The Reaction of Sulphur Dioxide and Oxygen at a Mild Steel Surface. G. Tolley. *Journal of the Society of Chemical Industry,* v. 67, Nov. 1948, p. 401-404.

Rates of combination of SO_2 and O_2 at a mild steel surface at various temperatures with dry and moist gases were measured. Sulphide and sulphate formation is found to occur simultaneously, the sulphide being concentrated close to the surface of the steel. Water vapor inhibits sulphide and sulphate formation, but increases the rate of oxidation. Scale formed in each case was analyzed and examined microscopically.

6B-4. The Corrosion of Metals in Atmospheres Containing Sulphur Dioxide. Part I. G. Tolley. *Journal of the Society of Chemical Industry,* v. 67, Nov. 1948, p. 404-407.

Results are presented for the corrosion of mild steel, sprayed aluminum, and aluminized steel by air containing from 0.2%-6% SO_2 at temperatures of 300-700°. The influence of gas velocity, temperature, and concentration of SO_2 was determined. Corrosion-time curves up to 40 hr. are given for 0.2% and 4% SO_2-air mixtures at 600°. Small concentrations of water vapor in the gas decrease corrosion of mild steel, but further additions increase it. The catalytic formation of SO_3 on the surface of the metals is of great importance in determining the rate of corrosion.

6B-5. Evaluation of Pickling Inhibitors From the Standpoint of Hydrogen Embrittlement. III. Conditions of Cathodic Pickling. (Concluded.) C. A. Zapffe and M. E. Haslem. *Wire and Wire Products,* v. 23, Dec. 1948, p. 1126-1130, 1172-1175.

In tests conducted under cathodic-pickling conditions the variable of metal attack is eliminated, the production of hydrogen on the metal surface is controlled, and any polar or ionic constituents of the inhibitor come under the influence of an electric field. Numerous reagents were tested. Most of them increase embrittlement both for mild and stainless steel. A very few inhibit embrittlement for mild steel; none for stainless. Results are shown graphically.

6B-6. Drill Pipe Corrosion Problems. G. L. Corrigan and A. E. Schlemmer. *American Society of Mechanical Engineers,* Advance Copy, Paper No. 48-PET-2, 1948, 9 pages.

Known methods for combatting corrosion, together with their possible bearing on the problem. The general corrosion problem; factors tending to promote and to prevent corrosion.

6B-7. Polar-Type Rust Inhibitors;

Methods of Testing the Rust-Inhibition Properties of Polar Compounds in Oils. H. R. Baker, D. T. Jones, and W. A. Zisman. *Industrial and Engineering Chemistry,* v. 41, Jan. 1949, p. 137-144.

Theory outlined in a previous paper is used to show that the various methods used emphasize different variables. It is concluded that no single test can suffice for all needs. The turbine-oil rusting test, the static water-drop corrosion test, and the fog-cabinet corrosion test are described and recommended; the latter two being new. Data for a number of different types of inhibitors and inhibited fluids.

6B-8. Action of Organic Acids on Stainless Steel. Charles F. Poe and E. M. Van Vleet. *Industrial and Engineering Chemistry,* v. 41, Jan. 1949, p. 208-210.

Strips of stainless resist the action of most dilute organic acids at 25° C. and at boiling temperatures, with the exception of boiling oxalic acid in normal concentration.

6B-9. Improvements in Acid Resisting Silicon Iron Alloys. J. E. Hurst. *Proceedings of the Chemical Engineering Group, Society of Chemical Industry,* v. 26, 1944, p. 72-79; discussion, p. 79-80.

Compositions, structures, properties, welding, and heat treatment procedures.

6B-10. Structure of Crystals of y-$Fe_2O_3 \cdot H_2O$, Formed During Corrosion of Iron. (In Russian.) N. A. Shishakov. *Zhurnal Fizicheskoi Khimii* (Journal of Physical Chemistry), v. 22, Aug. 1948, p. 953-955.

Results of X-ray diffraction study.

6B-11. Electronographic Investigation of the Size of Iron Crystals and the Thickness of Oxide Films Formed on Their Surfaces. (In Russian.) P. D. Dankov and N. A. Shishakov. *Zhurnal Fizicheskoi Khimii* (Journal of Physical Chemistry), v. 22, Aug. 1948, p. 956-960.

The above was investigated by X-ray and electron microscopy. Data indicate that the film is composed at least of two elementary nuclei of gamma Fe_2O_3,, and it is possible that one of them is Fe_3O_4 and the other Fe_2O_3. The range of thickness is about 16-18A.

6B-12. Behavior of Hydrogen in Steel During and After Immersion in Acid. Lawrence S. Darken and Rodney P. Smith. *Corrosion,* v. 5, Jan. 1949, p. 1-16; discussion, p. 16.

Experiments described are of two principal types, one designed to measure the permeability of steel to hydrogen, the other to measure the saturation concentration and diffusivity of hydrogen in steel, in each case with particular reference to factors associated with the solution in which the steel was immersed. Appendix consists of a derivation of an equation for diffusion of hydrogen from a plane surface into steel.

6B-13. Cathodic Protection Applied to Gas and Electric Utility Operations. William J. Schreiner. *Corrosion,* v. 5, Jan. 1949, p. 17-24.

Methods and experiences of Cincinnati Gas and Electric Co.

6B-14. Experience at Bagnell Dam to Prevent Corrosion of Underwater Steel and Iron. Turner White, Jr. *Corrosion,* v. 5, Jan. 1949, p. 25-26.

Experiences of past 10 years with cathodic protection and with aluminum paint.

6B-15. Corrosion Problems in Water Wells. T. E. Larson. *Corrosion,* v. 5, Jan. 1949, p. 27-30; discussion, p. 30-31.

Experience gained from installations during the past seven years indicates that corrosion of deep-well pumps may be mitigated by proper application of cathodic protection. Recommended procedures.

6B-16. Attenuation Equations Applied to Cathodic Protection by Distributed Drainage. E. P. Doremus, G. L. Doremus, and M. E. Parker, Jr. *Corrosion,* v. 5, Jan. 1949, p. 32-36.

Attenuation equations have been given which describe variations in current, potential, and cathodic current density along a long uniform structure protected by drainage from a single point. A later paper gave equations for a structure having a finite number of smaller drainage points. Further modification, including consideration of an infinite number of small drainage points, leads to further simplification of the resulting equations. The latter type of installation is employed in the use of magnesium anodes.

6B-17. Influence of Telurium on Hydrogen Absorption of Steel During Its Cathodic Polarization in Solutions of Sulphuric Acid. (In Russian.) M. N. Polukarov. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 21, June 1948, p. 611-619.

Experimental data. 12 ref.

6B-18. Solution of Carbon Steel by Monobasic Acids of the Aliphatic Series. (In Russian.) V. D. Yakhontov. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 21, June 1948, p. 667-675.

Results for the individual acids of the aliphatic series.

6B-19. Cathodic Protection. *Light Metals,* v. 11, Dec. 1948, p. 674-681.

First section of an exhaustive review of current literature and theory concerning the causes and prevention of chemical attack on steel, principally by soils or in soil environments. The development of systems in present use. Emphasis is on use of magnesium anodes to safeguard pipelines. (To be continued.)

6B-20. Tests of a 4,800-HP. Locomotive Gas Turbine. Alan Howard and B. O. Buckland. *Railway Age,* v. 126, Jan. 15, 1949, p. 22-26.

The condition of working parts after various periods of operation, with respect to wear, corrosion, and ash deposition. The nozzle alloy used contained 16% Cr, 25% Ni, 6% Mo, balance Fe. It was found to be unsatisfactory from the corrosion viewpoint, above 1500° F.

6C—Nonferrous

6C-1. The Anodic Oxidation of Gold in Alkali Hydroxide Solutions. (In English.) F. Jirsa. *Collection of Czechoslovak Chemical Communications,* v. 13, Oct. 1948, p. 505-513.

The mechanism and chemistry of the above were studied experimentally. 14 ref.

6C-2. Studies in Electrolytic Polarisation. Part V. Hydrogen Overpotential in Methanolic Solution. J. O'M. Bockris and Roger Parsons. *Transactions of the Faraday Society,* v. 44, Nov. 1948, p. 860-872.

The hydrogen overpotential was determined for the metals Bi, Tl, Ag, Ta, C (filament), C (rod), W, Mo, Au, Pt, and Pd, in methanolic and aqueous acid solutions. The Tafel equation is generally applicable to the results except for those for Tl and Ag in aqueous solution. Some evidence is given that this is due to a poisoning effect. 33 ref.

6C-3. Corrosion des toitures en zinc. (Corrosion of Zinc Roofs.) Marcel Pourbaix. *Métaux & Corrosion,* v. 23, Oct. 1948, p. 215-225.

Rapid corrosion of a zinc roof; factors responsible; Methods of prevention.

6C-4. Dezincification. G. T. Colegate. *Metal Industry,* v. 73, Dec. 17, 1948, p. 483-485; Dec. 24, 1948, p. 507-509; Dec. 31, 1948, p. 531-533.

Susceptible types of alloys; factors causing dezincification; and forms of dezincification. Internal and external influencing factors. Mechanisms involved; accelerated tests for susceptibility to dezincification; occurrence in practice. 28 ref.

6C-5. Intercrystalline Failure of Brasses and Aluminum Brasses in Air, Ammonia, and Certain Aqueous Solutions and Molten Metals. Part III. Cast and Wrought Beta and Beta Plus Gamma Brasses, With and Without Aluminium. Part IV. Cast Beta Brasses With and Without Aluminium. Marjorie E. Whitaker. *Metallurgia,* v. 39, Dec. 1948, p. 66-70.

Experimental results obtained by E. Voce and A. R. Bailey are tabulated and illustrated. Includes summary and conclusions covering all four parts.

6D—Light Metals

6D-1. Aluminum and Fruit Juices. P. E. Gilroy and F. A. Champion. *Journal of the Society of Chemical Industry,* v. 67, Nov. 1948, p. 407-410.

The interaction of fruit juices and aluminum was investigated. Pure Al and Al-Mn and Al-Mg alloys are suitable for the storage of certain fruit juices. They are also suitable for citrus juices if the SO_2 preservative is suitably controlled.

For additional annotations indexed in other sections, see:

2D-1; 3B-9; 4D-3; 18D-1-2; 22C-3; 23C-3

7

CLEANING and FINISHING

7A—General

7A-1. Abrasive Blasting as a Surface Preparation. J. F. Farrell. *Organic Finishing,* v. 9, Dec. 1948, p. 18-21, 23.

Choice of equipment, applications, and advantages.

7A-2. Chemical Cleaning of Heat-Exchanger Equipment. C. M. Loucks and C. H. Groom. *Oil and Gas Journal,* v. 47, Dec. 23, 1948, p. 66-67.

Methods for removal of deposits of various types. Table shows resistance of the various metals to attack by the different cleaning agents.

7A-3. How to Corrosion-Proof Metal Parts. Robert G. Clendenin. *Steel,* v. 123, Dec. 20, 1948, p. 85-87, 116, 118.

Various cleaning procedures including removal of such films as mineral and saponifiable oil, insoluble particles, smut, hard water and unrinsed cleaner salts, and oxides. Grease, solvent, oil, and plastic-type corrosion preventives.

7A-4. The Flame-Spraying of Metals and Plastics. V. E. Yarsley, W. D. Jones, and F. A. Rivett. *Plastic Institute Transactions,* Oct. 1948, p. 13-23.

Construction and use of the Schori spraying pistol and its application in metal spraying and plastic spraying.

7A-5. Process Sheet for Sodium Hydride Descaling. George Black. *American Machinist,* v. 92, Dec. 30, 1948, p. 127.

Process applicable to alloys of Cr, Cu, Ni, W, and Co, as well as plain carbon steels.

7A-6. Electro-Spray Finishing of Tackle Boxes. C. M. Long. *Products Finishing,* v. 13, Dec. 1948, p. 32-34.

Both wrinkle finishes and glossy enamels are applied.

7A-7. Finishing Clinic. *Products Finishing,* v. 13, Dec. 1948, p. 60, 62, 64, 66, 68, 74, 76, 78, 80, 82, 84, 86.

Recent engineering developments in piping and heating plating baths; methods and equipment for baking organic coatings; some effects of surface-active agents in metal cleaning; proper spray-gun technique for economical finishing.

7A-8. Finishing Fine Costume Jewelry. Michael Spirito. *Industrial Finishing.* v. 25, Dec. 1948, p. 75-76, 79-80, 82.

Step-by-step methods used in applying decorative and protective coatings.

7A-9. Metallspritzpistolen. (Metal Spray Guns). H. Reininger. *Metalloberfläche,* v. 2, Jan. 1948, p. 1-13.

A survey of the most important types, their development and features of construction. 39 ref.

7A-10. Ceramic Coated Metals for Aircraft Power Plant Applications. R. A. Jones. *Steel Processing,* v. 34, Dec. 1948, p. 649-651.

Reviews work of Air Materiel Command.

7A-11. Solvent Degreasing—A Production "Tool." A. E. Rylander. *Tool Engineer,* v. 22, Jan. 1949, p. 21-23.

The three basic parts of degreasers for metallic or other nonporous materials; applications and advantages.

7A-12. Metallising in Relation to Foundry Practice. J. Barrington Stiles. *Foundry Trade Journal,* v. 85, Dec. 2, 1948, p. 525-530; Dec. 9, 1948, p. 551-552; discussion, p. 552-554.

Equipment, methods, and applications.

7A-13. Metal Finishing. Adolph Bregman. *Iron Age,* v. 163, Jan. 6, 1949, p. 274-281.

Noteworthy advances in basic metal finishing knowledge, the improvement of instruments for studying electroplate quality, the development of improved nonmetallic finishes, commercial position of the industry, and general technological progress during 1948.

7A-14. Protective Coatings. Joseph Mazia. *Machine Design,* v. 21, Jan. 1949, p. 110-114.

Characteristics and applications of chemical-conversion finishes of various types for application to metals.

7A-15. Degreasers. Frank V. Faulhaber. *Products Finishing,* v. 13, Jan. 1949, p. 26, 28, 30, 32, 34, 36.

Types of degreasers; design, selection, installation, and operation of the units.

7A-16. Technical Progress in Metal Finishing During 1948. Walter A. Raymond. *Metal Finishing,* v. 47, Jan. 1949, p. 44-53, 99-101.

134 references.

7A-17 (Book). **Electrolytic Polishing and Etching of Metals.** (In Russian.) V. I. Layner. 243 pages. 1947. MASHGIZ (State-Scientific Publishing Co. for Machine-Construction Literature), Moscow, U.S.S.R. 21 roubles.

Main sections are concerned with electrolytic pickling; electropolishing in production of electroplated coatings; and electropolishing of metallographic specimens. The book is a heterogeneous mixture of literature review including patents; and descriptions of original work. While the section on pickling is largely based on the literature, most of the section on electropolishing deals with original research. (From review in *Electroplating and Metal Finishing.*)

7B—Ferrous

7B-1. Aluminum Coating Steel. C. B. Ulshafer. *Wire and Wire Products,* v. 23, Dec. 1948, p. 1124-1125.

Various methods, their advantages and disadvantages. Need for further research. States that "a market is ready and waiting for the commercial advent of aluminum-coated steel".

7B-2. Manual Pickling Operation. A. M. Langbein. *Industrial Heating,* v. 15, Dec. 1948, p. 2158-2161. A condensation.

Equipment for manual pickling of metal prior to porcelain enameling.

7B-3. A Survey of Drying Practices in the Porcelain Enamel Industry. George N. Tuttle. *Better Enameling,* v. 19, Dec. 1948, p. 8-12, 32.

7B-4. Application of Cover Coats Directly on Steel. M. E. McHardy. *Better Enameling,* v. 19, Dec. 1948, p. 14-15, 33.

Use of titanium-containing killed steel in production of porcelain-enameled parts, using zirconium cover coat. Pickling, spraying, and firing methods.

7B-5. Trouble Shootin'. John L. McLaughlin. *Better Enameling,* v. 19, Dec. 1948, p. 22-23.

Continues series on porcelain enamel defects and their prevention. Deals with poor adherence of blue ground coat and ground coat color (darker or lighter than normal).

7B-6. Rustproofing Steel Parts. *Western Machinery and Steel World,* v. 39, Dec. 1948, p. 90-91.

Equipment and procedures of California Parkerizing Co. Operations fall into four basic categories: Parkerizing, Bonderizing, Parco Lubrizing and baked enameling.

7B-7. First Things First, in Silver Plating. James E. Bottomley. *Electroplating and Metal Finishing,* v. 1, Dec. 1948, p. 766-768.

The preparation of metal surfaces for silver plating from the practical standpoint.

7B-8. Modern Heat Applications in Galvanizing. W. O. Owen. *Steel Processing,* v. 34, Dec. 1948, p. 659-662.

Various methods and equipment for heating galvanizing kettles. Advantages and limitations of each.

7B-9. Flame Peeling Removes Mill Scale. L. D. Robson. *Power,* v. 93, Jan. 1949, p. 103.

Brief application of hot flame cleans boiler tubes quickly before installation, thus minimizing localized electrolytic attack during service.

7B-10. Driving and Controlling A Modern Strip Pickling Line. J. Raymond Erbe. *Iron Age,* v. 163, Jan. 13, 1949, p. 46-50.

Three separate adjustable-voltage drives, with acceleration and retardation automatically handled by a Rototrol system, are used in the new line at the Aliquippa plant of Jones & Laughlin Steel Corp.

7B-11. Special Steels and Their Preparation for Enameling. Frank R. Porter. *Better Enameling,* v. 20, Jan. 1949, p. 17-19.

Special attention to zirconium and titanium oxide enamels.

7B-12. Trouble Shootin'. John L. McLaughlin. *Better Enameling,* v. 20, Jan. 1949, p. 28-29.

The enameling defect known as "copperhead."

7B-13. How to Apply Titanium Enamel to Titanium Steel. John C. Swartz. *Steel,* v. 124, Jan. 17, 1949, p. 64-65, 96.

Previously abstracted from *Better Enameling.* See item 7b-218, 1948.

7B-14 (Book). **A Manual of Porcelain Enameling.** Abridged Ed. 127 pages. Enamelist Publishing Co., 4510 E. 56th St., Cleveland 5, Ohio. $1.00.

Contains charts, graphs, and other useful data.

7C—Nonferrous

7C-1. Vapour Blast; Applications in the Non-Ferrous Metal Industry. *Metal Industry,* v. 73, Dec. 10, 1948, p. 471-472.

7C-2. Patinising Zinc. Hanns Benninghoff. *Electroplating and Metal Finishing,* v. 1, Dec. 1948, p. 782-783.

A chemical-solution method of producing a true patina on zinc surfaces without use of electroplating, recently developed in Germany.

7C-3. High-Temperature Ceramic Coatings for Molybdenum. *Ceramic Age,* v. 52, Dec. 1948, p. 312-313.

See abstract of paper by D. G. Moore, L. H. Bolz, and W. N. Harrison. *National Advisory Committee for Aeronautics, Technical Note,* item 7C-30.

7C-4. High-Temperature Ceramic Coatings for Molybdenum; Bureau Tests Point to Successful Results. *Enamelist,* v. 25, Dec. 1948, p. 50-51, 53-54. (Based on paper by D. G. Moore, L. H. Bolz, and W. N. Harrison.)

Previously listed from *National Advisory Committee for Aeronautics,* Technical Note No. 1626, (See item 7C-30, 1948.)

7C-5. Decorative Finishes for Lead. Kempton H. Roll. *Metal Finishing,* v. 47, Jan. 1949, p. 64-67.

Chemical, painting, and plating methods, including surface preparation.

7D—Light Metals

7D-1. Finishing Washer Tubs and Machines. R. A. Moore. *Products Finishing,* v. 13, Dec. 1948, p. 54-56.

Use of organic finish known as "Superclad" for aluminum tubs and machines.

7D-2. Functional Use of Lacquer. George A. Moore, *Paint and Varnish Production Manager,* v. 29, Jan. 1949, p. 10, 12-13, 16-17.

Functions and applications. New developments in lacquering of aluminum.

7D-3. Vitreous Enamels for Aluminum. P. J. Carlisle, A. J. Deyrup and A. O. Short. *Finish,* v. 6, Jan. 1949, p. 42-43, 68, 70.

Comprehensive official release of technical data.

7D-4. Enamels for Aluminum Are Here. *Ceramic Industry,* v. 52, Jan. 1949, p. 73, 180.

Commercial application of methods and compositions developed by Du Pont. Details of procedure, including an accelerated spalling test.

7D-5. Prime Coating Aluminum Sheet. Clyde St. John. *Iron Age,* v. 163, Jan. 13, 1949, p. 42-45.

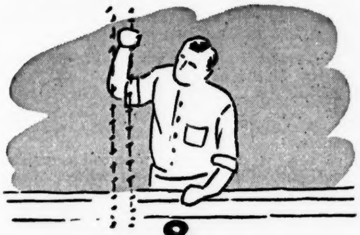
A wash primer containing a vinylbutyral resin pigmented with zinc chromate is in use at Permanente Metals Corp. The technique used for coating sheet and coils. The coating is not disturbed by subsequent light drawing and forming and gives effective protection from corrosion.

7D-6. Vitreous Enamels for Aluminum. *Iron Age,* v. 163, Jan. 13, 1949, p. 57.

Recently announced Du Pont development.

For additional annotations indexed in other sections, see:

6A-4; 6B-14; 9-7; 15-6; 16B-9; 21A-6; 21D-3; 22B-22



8 ELECTRODEPOSITION and ELECTROFINISHING

8-1. The Effect of Ionic Addition Agents on the Polarization of Electrodeposition of Copper. Thomas B. Lloyd, Milton R. Lauver, and Frank Hovorka. *Journal of the Electrochemical Society,* v. 94, Dec. 1948, p. 341-352.

Cathode potentials were measured during electrodeposition of Cu on smooth platinum from a cupric nitrate solution. Various inorganic salts and acids were added to the simple bath and the resulting effect on cathode potentials noted. The effect of addition agents on surface appearance was also noted.

8-2. The Oxygen Efficiency in Anodic Oxidation of Aluminum. John Kronsbein. *Journal of the Electrochemical Society,* v. 94, Dec. 1948, p. 353-366.

Experiments led to the abandonment of the view that anodic coatings on aluminum "grow inward" because of slow chemical solubility of the oxide. Introduces the idea of "oxygen efficiency"—the fraction of the electric current responsible for formation of aluminum oxide, the remainder causing either generation of free oxygen or anodic dissolution of the metal. This leads to simple equations permitting correlation of current density, temperature of electrolyte, and concentration with efficiency.

8-3. Gold and Chromium Combination Plating. W. A. Hopkins. *Iron Age,* v. 162, Dec. 23, 1948, p. 60-61.

The area of the base nickel plate to be gold plated is masked during chromium deposition. Then the entire part, unmasked, can be gold plated since the gold will adhere to the nickel surface but not to the sections already covered with chromium.

8-4. Measurement of Chromium Plating Thickness. C. H. R. Gentry and D. Newson. *Electroplating and Metal Finishing,* v. 1, Dec. 1948, p. 759-765.

Semi-automatic apparatus for routine checking to specification limits by unskilled operators. Another device suitable for laboratory testing.

8-5. Notes on Bright Silver Plating. E. W. Wilson. *Electroplating and Metal Finishing,* v. 1, Dec. 1948, p. 788-790. A condensation.

Recommended procedures for surface preparation; CS_2 bright plating solutions; brightening with selenium compounds.

8-6. Chromium Plating in Maintenance Practice. Richard M. Wick. *Iron and*

Steel Engineer, v. 25, Dec. 1948, p. 54-59; discussion, p. 59-60.

Miscellaneous examples. The high-speed method developed by the author is said to have led to major economies.

8-7. Barrel Plating; Plant—Processes—Electrolytes. R. Macnair. *Metal Industry,* v. 73, Nov. 5, 1948, p. 366-368; Nov. 19, 1948, p. 406-408; Dec. 3, 1948, p. 448-451.

The various types of plant, solution capacities, and current allowances. Latest developments in horizontal and automatic plating barrels.

8-8. Plating Decorative Automotive Hardware. Henry R. Hawkinson. *Products Finishing,* v. 13, Dec. 1948, p. 20-26.

New plating installation of Cannon Electric Development Co.

8-9. Barrel Finishing of Metal Products. Part 26. Barrel Finishing and Its Relation to the Stability of Electrodeposited Surfaces. H. Leroy Beaver. *Products Finishing,* v. 13, Dec. 1948, p. 38, 40, 42, 44, 46, 48, 50.

8-10. Ultramicroscopic Investigation of Electrolysis of Aqueous Solutions of Copper Sulphate. (In Russian.) M. N. Polukarov. *Zhurnal Obshchei Khimii* (Journal of General Chemistry), v. 18, (80), July 1948, p. 1249-1258.

The formation of colloidal systems in the pre-cathode zone of the electrolyte and direct participation of such colloidal particles in the formation of cathode deposits were established.

8-11. Plating Shop Construction and Equipment. H. E. Hutchinson. *Journal of the Electrodepositors' Technical Society,* v. 23, 1948, p. 163-167. (Reprint).

Notes are based on the author's experience of building and equipping a plating shop, in which Ag, bright Ni-Co and Cr are deposited. 11 ref.

8-12. Bright Nickel Plating Practice in the U.S.A. H. Silman. *Journal of the Electrodepositors' Technical Society,* v. 23, 1948, p. 169-176; discussion, p. 176-178. (Reprint).

Methods for the bright nickel plating of steel, and the tendency towards use of organic bright solutions as against the cobalt-formate type of solution used almost exclusively in Britain.

8-13. Review of Methods of Thickness Testing of Electrodeposited Coatings. H. H. Egginton. *Journal of the Electrodepositors' Technical Society,* v. 23, 1948, p. 191-198; discussion, p. 199-202. (Reprint).

Seven methods were checked against analysis of a given area which was accepted as the standard. Methods are classified in order of accuracy, ease of application, and equipment required.

8-14. Shear Tests of the Adhesion of Electrodeposited Chromium to Steel. E. Zmihorski. *Journal of the Electrodepositors' Technical Society,* v. 23, 1948, p. 203-213. (Reprint). Translated from the Polish.

Effects of the following variables: type of etching treatment used in preparation for plating, thickness of chromium deposit, composition of plating solution and current density, hardness of base metal, effect of heat treatment, and effect of rolling fatigue. Test method and results. Recommendations for surface preparation and thickness of deposit.

8-15. Le Chromage dur sur les alliages légers. (Hard Chromium Plating of Light Alloys.) Jos. Patrie. *Revue de l'Aluminium,* v. 25, Nov. 1948, p. 335-338.

Experimental data permitted establishing optimum conditions for the electrodeposition of a rather thick coating of Cr (20μ-1 mm.) and the necessary composition of the electrolyte.

8-16. A Modern Electroplating Laboratory. Myron B. Diggin. *Plating,* v. 36, Jan. 1949, p. 38-45.

Laboratory of Hanson-Van Winkle-Munning Co.

8-17. Deposition of Precious Metal Alloys. II. Binary Silver Alloys From Acid Chloride Solutions. III. Platinum-Gold, Silver-Gold, and Silver-Platinum-Gold Alloys From Acid Chloride Solutions. A. K. Graham, S. Heiman, and H. L. Pinkerton. *Plating,* v. 36, Jan. 1949, p. 47-49, 79.

The previous section described numerous unsuccessful attempts to deposit Ag-Pt alloys from alkaline solutions. These first results were so discouraging that attention was turned to acid electrolytes. Satisfactory results were obtained in deposition of a variety of the compositions indicated above by use of acid chloride baths. 14 ref.

8-18. Heavy Chromium Plating of Massive Objects Is Big Business. *Plating,* v. 36, Jan. 1949, p. 50-53.

Some of the jobs done by Chromium Corp. of America in plants at Waterbury, Conn., Chicago, and Cleveland.

8-19. The Effect of Impurities and Purification of Electroplating Solutions. I. Nickel Solutions. II. Correlated Abstract and Critical Review. D. T. Ewing and W. D. Gordon. *Plating,* v. 36, Jan. 1949, p. 58-61.

Part of AES Research Project No. 5.

8-20. Electrochemical Laboratory Devoted to Experimental and Service Work in Electroplating and Polishing. *Steel,* v. 124. Jan. 10, 1949, p. 66, 69.

New laboratory of Hanson-Van Winkle-Munning Co.

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8-21. **Zur Theorie der Bedeckungschichten an Anoden,** (Concerning Theory of Anodic Deposition.) K. Konopicky. *Korrosion und Metallschutz,* v. 21, Mar.-Apr. 1945, p. 40-43.

An experimental study, confirming the assumptions from which come certain equations, and refuting Weiner and Halla's theoretical objections.

8-22. Electrolytes for Refining and Electrodeposition of Lead. I. Influence of Surface-Active Substances on the Kinetics of the Cathode Process and Structure of the Deposit. (In Russian.) M. Loshkarev and I. Mark. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 21, June 1948, p. 589-599.

Effects of a series of organic additives and anions on the kinetics and structure of the above. Surface activities of these substances were found to be the basic regulators of deposit growth. 16 ref.

8-23. Sur une cause d'erreur dans le tracé de la courbe courant-tension des électrolytes de polissage anodique. Application a l'étude du mécanisme du polissage. (Concerning a Source of Error in Plotting the Current-Voltage Curve of Electrolytes for Anodic Polishing. Application to the Study of the Mechanism of Polishing.) Pierre A. Jacquet. *Comptes Rendus* (France), v. 227, Sept. 20, 1948, p. 591-593.

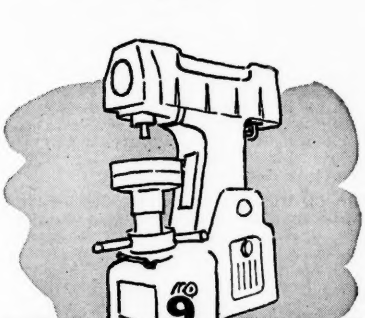
Certain disagreements between actual and theoretical results based on the above curve were investigated. It was found that the curve depends to a great extent on the degree of smoothness or roughness of the surface being electro-polished.

8-24. Throwing Power of Electroplating Solutions. Part II. A. Mankowich. *Metal Finishing,* v. 47, Jan. 1949, p. 54-55; discussion, p. 55, 67.

Discussion of Haring and Blum's formula. Derivation, discussion of factors involved, and concluding remarks. Discussion is by Geo. E. Gardam.

For additional annotations indexed in other sections, see:

7A-7; 7B-7; 9-16; 11-19; 18B-14; 21C-1



PHYSICAL and MECHANICAL TESTING

9-1. Fatigue Testing of Wire. F. A. Votta, Jr. *Wire and Wire Products,* v. 23, Dec. 1948, p. 1117-1123.

See abstract of paper from *Iron Age,* item 9a-65, 1948.

9-2. Effect of Fatigue on Tension-Impact Resistance. William H. Hoppmann, II. *ASTM Bulletin,* Dec. 1948, p. 36-38.

Previously abstracted from *American Society for Testing Materials, Preprint* 1948. See item 9a-42, 1948

9-3. Measuring Creep With Strain Gages. *Iron Age,* v. 162, Dec. 23, 1948, p. 59.

New technique reported by the Canadian Bureau of Mines.

9-4. Gray Iron Transverse Test Bars. (Concluded.) Jack H. Schaum. *Foundry,* v. 77, Jan. 1949, p. 82-85, 222.

Methods of producing and testing developed at Naval Research Laboratory, Washington.

9-5. Determination of Yield Point During Bending and Torsion. (In Russian.) N. N. Davidenkov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1233-1237.

Analyzes the above on the basis of the assumption of two conditional yield points during bending and torsion—one real, and the other nominal. Formulas and diagrams are proposed, permitting calculation of the influence of residual stresses on the residual deformation.

9-6. Bending Tests on Disks Supported on Their Periphery. (In Russian.) Ya. B. Fridman and I. M. Roitman. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1238-1240.

This type of test characterizes the mechanical properties of high-strength metals better than tensile and bending tests on flat specimens.

9-7. Method of Testing the Durability of Corrosion Resistant Coatings on Steel Under Alternating Stresses. (In Russian.) A. N. Mitinskii and E. S. Reinberg. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1247-1250.

A fatigue-test machine applicable to the above. Method of testing and results obtained.

9-8. Determination of Tangential Stresses in Round Rods and Tubes Under Plastic Torsion. (In Russian.) N. F. Lashko. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1251-1254.

Proposes a series of equations for calculation of the above. Graphic interpretation of these formulas, for different ferrous and nonferrous metals. Influence of several factors, such as composition and method of heat treatment.

9-9. Horizontal Materials-Testing Machine. (In Russian.) S. E. Khanin. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1269-1271.

A newly developed apparatus which may be applied to the study of deformation and to the determination of tensile, compressive, and bending stresses.

9-10. Apparatus for Mechanical Testing of Locomotive and Other Piston Rings. (In Russian.) P. G. Korolev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1271.

A newly developed apparatus which permits determination of elastic and residual deformation during application of a concentrated force.

9-11. All-Electronic Testing Machine. *Machine Design,* v. 21, Jan. 1949, p. 140-141.

Designed primarily for low-capacity research work, the tester utilizes electronic control of the loading, force-measuring, and strain-measuring systems. Capable of applying loads up to 5000 lb., the machine is nevertheless sensitive within 0.1%.

9-12. Stress-Strain Relations for Uniaxial Loading. J. H. Palm. *Applied Scientific Research,* v. Al, No. 3, 1948, p. 198-214.

Mathematical expressions for the above, as proposed by Ludwik and Hollomon. It is shown that these empirical formulas cannot agree with the essential behavior of a metal during uniform straining. The existence of one and the same stress-strain relation for uniform uniaxial tension and compression is emphasized. A mathematical expression can be derived which essentially agrees with the experimentally determined stress-strain relation. 10 ref.

9-13. World's Most Powerful Universal Testing Machine. *Baldwin,* v. 4, 3rd and 4th qtr., 1948, p. 9-13.

The 5,000,000-lb tension-compression machine recently installed at the Philadelphia Naval Base of the U. S. Navy, its operation, and applications.

9-14. Draw Tools for Single-Action Presses. J. W. Lengbridge. *Tool Engineer,* v. 22, Jan. 1949, p. 33-36.

Installment No. 8 of a series on the theory and practice of pressing aluminum.

9-15. Ein einfacher Mikrohärteprufapparat mit vielen praktischen Verwendungsmöglichkeiten. (A Simple Microhardness Tester With Many Practical-Application Possibilities.) E. B. Bergsmann. *Schweizer Archiv fur angewandte Wissenschaft und Technik,* v. 14, Oct. 1948, p. 294-299.

A rather new method of hardness testing.

9-16. Verschleissprufung von Hartchromschichten. (Testing the Wear Resistance of Hard Chromium Plating.) Hans Wahl and Karl Gebauer. *Metalloberfläche,* v. 2, Feb. 1948, p. 25-37.

Study of different types of wear under various conditions, including the effect of temperature, current density, and nature of the electrolyte on the hardness and wear resistance of chromium plating. Test data, and method of testing.

9-17. Measuring the Hardness of Metals. *Tool & Die Journal,* v. 14, Jan. 1949, p. 61-62, 64, 66, 76.

Various standard methods and apparatus.

9-18. Zugfestigkeitswerte von Umschmelzaluminium-Gusslegierungen in Abhängigkeit vom Querschnitt. (Effect of Cross Section on the Tensile Strength of Cast Aluminum Alloys Produced From Scrap.) August Buckeley and Armin Einenkel. *Zeitschrift fur Metallkunde,* v. 39, Jan. 1948, p. 28-32.

Experimental determination. Type of tensile test piece used.

9-19. Bemerkung zur Temperaturabhängigkeit der Schlagbiegefestigkeit von Zinklegierungen. (Remarks Concerning the Temperature Dependence of the Impact Strength of Zinc Alloys.) Friedrich Erdmann-Jesnitzer and Wilhelm Hofmann. *Zeitschrift fur Metallkunde,* v. 39, Mar. 1948, p. 65.

A criticism of the impact-bending and notch impact tests reported by N. Ludwig in recent German publications. A temperature-impact curve shows the authors' results.

9-20. Beitrag zur Frage der Definition der Dauerstandfestigkeit von Leichtmetall-Legierungen. (A Contribution to the Problem of Determining the Fatigue Strength of Light-Metal Alloys.) Hugo Vosskuhler. *Zeitschrift fur Metallkunde,* v. 39, Mar. 1948, p. 79-87.

Long and short-time tests made in the range 30-150° C. on a variety of Al and Mg alloys. 14 ref.

9-21. A New Micro-Hardness Tester. Paul Ramsthaler. *Microtecnic* (English Edition), v. 11, Oct. 1948, p. 207-211. Translated from the German.

Instrument developed in Germany, 1940-1942.

9-22. Comparison of Notch Tests and Brittleness Criteria. C. J. Osborn, A. F. Scotchbrook, R. D. Stout, and B. G. Johnston. *Welding Journal,* v. 28, Jan. 1949, p. 24s-34s.

Progress Report No. 1 from Lehigh University on the effect of fabrication processes on steels used in pressure vessels. Results of a comparison of different test meth-

ods, on the basis of which the procedure to be used in the main program was determined.

9-23. Use of Hardness Data Restricted. A. R. Troiano. *Steel,* v. 124, Jan. 17, 1949, p. 66-71.

Limitations of the end-quenched hardenability test as a means of comparing various steels are discussed in connection with an X-ray diffraction study of retained austenite in Jominy test bars and austenite transformation diagrams for steels SAE 5140, 2340 and T1340. Structural variations may exist which are not evident from hardness data alone. Includes graphs, tables, and photomicrographs. 14 ref.

9-24. Apparatus for Tensile Testing at Sub-Zero Temperatures. E. J. Ripling and G. Tuer. *Product Engineering,* v. 20, Jan. 1949, p. 103-105.

Apparatus is designed to be used in conjunction with a special fixture to produce a maximum eccentricity of less than 0.002 in. in loading.

9-25. Bonded Resistance Wire Gages for Strain Measurements. Arthur C. Ruge. *Product Engineering,* v. 20, Jan. 1949, p. 116-117.

Six setups for uniaxial and four for biaxial stresses.

9-26. A Method of Fitting the Andrade Creep Equation to Experimental Results. A. J. Kennedy. *Proceedings of the Physical Society,* v. 61, Dec. 1, 1948, p. 510-515.

A method by which the constants in the above fromula for the flow of metals under constant stress can be rapidly deduced from experimental results by direct reading from a system employing sliding templates of calculated shape. The general equation to which the method is applicable is derived.

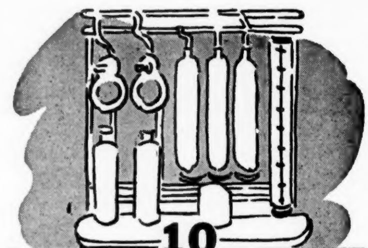
9-27 (Book). **Evaluation of Residual Stress.** K. Heindlhofer. 196 pages. 1948. McGraw-Hill Book Co., Inc., 330 West 42nd St, New York 18. $4.00.

Intended as a text for graduate students in mechanical engineering and metallurgy or as a reference book. The commercial importance of residual stresses in metals; limitations of stress analysis imposed by anisotropy; pertinent phases of theory of elasticity and mapping of stresses; methods and apparatus for residual-stress determination. The concluding chapter describes certain examples.

9-28 (Book). **The Strength of Light Alloy Struts.** J. F. Baker and J. W. Roderick. 148 pages. 1948. Aluminium Development Assn., 33 Grosvenor St., London W.1, England. 21s. net.

Results of experimental investigation conducted since 1944. Theory; properties of material affecting strut failure; strut tests on extruded sections; and summary and conclusions. The greater part is a description of test methods, a discussion of tests, and an analysis of test results.

For additional annotations indexed in other sections, see: 3A-1-3-11; 19A-15; 22C-3



10 ANALYSIS

10A—General

10A-1. Colorimetric Determination of Iron With Isonitrosodimethyldihydroresorcinol. Sudhir Chandra Shome. *Analytical Chemistry,* v. 20, Dec. 1948, p. 1205-1208.

Spectrophotometric study of the color reaction between the above reagent and iron (ferric or ferrous ion) indicates its suitability. Iron is estimated in the presence of comparatively large amounts of Ni, Co, phosphate, arsenate, fluoride, oxalate, citrate, tartrate, borate, perchlorate, etc., in slightly acid medium. It can be detected in amounts as small as one part in 50,000,000 parts of solution.

10A-2. Rapid Quantitative Analysis by X-Ray Fluorescence Method. Marcel A. Cordovi. *Steel,* v. 123, Dec. 20, 1948, p. 88-92, 94.

Results of experiments indicate that a few modifications in present design will bring accuracy within limits required for routine quantitative chemical analysis of metals.

10A-3. Rapid Test for Small Concentrations of Cadmium in Zinc Solutions. R. S. Young and C. W. Barker. *Chemist Analyst,* v. 37, Dec. 1948, p. 81, 83.

Method used in the zinc industry to determine completeness of removal of cadmium from $ZnSO_4$ solution, prior to electrowinning of the latter, by agitating with zinc dust and filtering off the precipitated Cd and excess zinc dust. Addition of zinc dust and agitation is continued until the Cd content falls to a stipulated level.

10A-4. 2.2-Diquinolyl, a Specific Reagent for Copper. J. Hoste, *Research,* v. 1, Dec. 1948, p. 713-715.

The above compound forms a complex of a deep purple color with monovalent copper. It may be used for the spot-test identification of copper, the reaction being specific and highly sensitive. Both qualitative detection and colorimetric estimation of small quantities of copper, without preliminary separations, even in the presence of high concentrations of colored ions, such as those of Ni, Fe, and Co, are feasible.

10A-5. Influence of Complex Formation on Magnitude of Potential of Systems Having Analytical Significance. I. (In Russian.) V. S. Syrokomskii and V. B. Avilov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1151-1159.

Method and apparatus used. As an example, the influence of complex formation agents in the ferrous-ferric ion system was investigated. 15 ref.

10A-6. Colorimetric Determination of Mixtures of Two Colored Components. (In Russian.) A. K. Babko and M. M. Korsun. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1160-1170.

Reviews existing methods (chemical, spectrophotometric, and photocolorimetric) for the above. Means of simplifying the procedure, shortening the time of determination, and decreasing the cost. Comparative data for determination of Mn, Cr, and Fe are tabulated. 18 ref.

10A-7. New Rapid Method of Quantitative Phase Analysis. (In Russian.) L. G. Berg. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1171-1175.

Methods and apparatus applicable to investigation of ores and mineral compounds (oxides and hydroxides). Results of typical analyses.

10A-8. Rapid Method of Direct Determination of Trivalent Iron by Titration With Mercurous Nitrate. (In Russian.) S. A. Babushkin and M. L. Pogrebinskaya. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1182-1186.

The method is characterized by its rapidity and convenience. It does not require use of an inert-gas atmosphere.

10A-9. Investigation of the Possibility of Simultaneous Determination of Nickel and Cobalt by Electrometric Titration. (In Russian.) V. G. Sochevanov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1187-1194.

Experimental verification of the possibility of cyanometric determination of nickel and cobalt by noncompensating electrometric titration as described by Chirkov. Determination of Ni in the absence of Co gives reliable results. However, in the presence of Co, the reliability of the results is questionable. 10 ref.

10A-10. Determination of Magnesium, Molybdenum and Nickel by Polarometric Titration. (In Russian.) Z. S. Mukhina. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1194-1198.

A new polarometric method characterized by its rapidity. Accuracy is sufficient for industrial application.

10A-11. Potentiometric Determination of Manganese in Manganous Ores, Ferromanganese, Nichrome, and High-Chromium Steels. (In Russian.) A. I. Busev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1198-1202.

Noncompensating potentiometric method, characterized by oxidation of bivalent to trivalent Mn, and applicable to concentrations of 0.1-90% Mn. The presence of other metals does not interfere.

10A-12. Uber die Verluste, die bei der Auflösung von Metallen und Legierungen entstehen. (Concerning Losses Resulting From the Solution of Metals and Alloys.) L. Hertelendi. *Fresenius' Zeitschrift fur Analytische Chemie,* v. 128, Nos. 2-3, 1948, p. 115-127.

Analytical errors and several methods for minimizing them. 12 ref.

10A-13. Die Vorbereitung von Metall- und Legierungsmustern zur Analyse: Homogenisierung durch Zusammenschmelzen. (Preparing Samples of Metals and Alloys for Analysis: Homogenization by Fusion.) L. Hertelendi. *Fresenius' Zeitschrift fur Analytische Chemie,* v. 128, Nos. 2-3, 1948, p. 129-140.

An experimental study of the melting of different metals and alloys together to insure homogeneity for analysis.

10A-14. Wirkung einiger Red.-Ox.-Systeme auf Kakothelin und Methylenblau. Anwendungen zum selektiven Nachweis von Thiosulfat. Kupfer. Eisen. Formaldehyd und von Oxydationsmitteln. (Action of Some Reduc-

tion-Oxidation Systems on Cacotheline and Methylene Blue. Application to Selective Identification of Thiosulfate, Copper, Iron, Formaldehyde, and of Oxidation Agents.) Rudolph Lang. *Fresenius' Zeitschrift fur Analytische Chemie,* v. 128, Nos. 2-3, 1948, p. 167-178.

10A-15. Bericht uber die Fortschritte der analytischen Chemie. I. Allgemeine analytische Methoden, analytische Operationen, Apparate und Reagenzien. II. Chemische Analyse anorganischer Stoffe. (Report on Progress Made in Analytical Chemistry. I. General Analytical Methods, Analytical Operations, Apparatus, and Reagents. II. Chemical Analysis of Inorganic Substances.) A. Kurtenacker. *Fresenius' Zeitschrift fur Analytische Chemie,* v. 128, Nos. 2-3, 1948, p. 313-360.

Part I describes and diagrams a number of new methods reported recently (within the last 5-10 years.) Part II reviews work on analysis of Be, Al, Mn, Mn bronzes, Co, Ni, and Ni bronzes. 230 ref.

10A-16. Simple Tests for Identifying Metals by Appearance, Chip Test, and Blowpipe Test. *Linde Tips,* v. 28, Jan. 1949, p. 12-13.

A table.

10A-17. Dosage du tantale et du niobium dans le ferrotantale, le ferroniobium et les aciers. (Determination of Tantalum and Columbium in Ferrotantalum, Ferrocolumbium, and Steels.) B. Emile Jaboulay. *Revue de Métallurgie,* v. 45, Sept. 1948, p. 343-346.

New chemical analysis method for direct determination of the above. Theoretical bases and accuracy. Data for typical determinations.

10A-18. Chemical Analysis of Heat Treating Salts. Part I. Vincent C. Petrillo. *Steel Processing,* v. 34, Dec. 1948, p. 652-657, 666.

Development of accurate, precise, and rapid chemical methods for water-insoluble matter, chlorides, carbonates, and silica. 14 ref. (To be continued.)

10A-19 (Book). **Metallurgical Analysis. Ed. 2.** V. Gopalam Iyer. 612 pages. 1947. The Author, College of Mining and Metallurgy, Benares Hindu University, Benares, India.

States briefly the principle on which each determination is made and describes the anlytical procedure for acidimetry, alkalimetry, oxidation and reduction reactions, analysis of pig iron, carbon steel, alloy steels, nonferrous alloys, ore assays, refractory materials, and ferro-alloys.

10B—Ferrous

10B-1. Analysis of Steel Speeded by Improved Combustion Technique. *Industrial Heating,* v. 15, Dec. 1948, p. 2116, 2118.

Method developed by H. J. Wolthorn of Carnegie-Illinois Steel Corp. is carried out at a temperature of 1100° C., about 60° higher than the former combustion procedure. Three electrically heated furnaces, using nonmetallic resistor heating elements, are each equipped with two silica tubes, so that six samples can be analyzed at the same time. Simplified preparation of samples, plus the higher test temperature used, has reduced the time for individual tests from an average of 10 to 8 min.

10B-2. Moly Mold Samples Increase Accuracy of Spectrographic Analysis. Henry A. Tuttle and Ford R. Bryan. *Iron Age,* v. 162, Dec. 23, 1948, p. 57-59.

By casting samples of cast iron and cast steel in a molybdenum insert mold, spectrographic analysis deviations are cut to as little as one-third of the variance experienced with samples from iron molds.

10B-3. Investigation of Method for Analysis of Steel by Partial Solution of the Test Specimen. (In Russian.) E. P. Terent'eva. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1203-1207.

Investigates the applicability of method of Tananaev on an industrial scale. Data obtained in the determination of manganese and nickel showed promising results. Time of determination is between 11 and 13 min. Only part of the sample is dissolved, leaving the remainder for further analysis. Results of a typical determination of Mn and Ni were encouraging.

10B-4. Photocolorimetric Method of Determination of Silicon in Cast Irons and Steels. (In Russian.) E. E. Cheburkova. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1261-1262.

A method based on the formation, with molybdic acid, of a heteropoly acid of yellow color which forms molybdenum blue when reduced with tin chloride.

10B-5. Rapid and Accurate Method for Determination of Small Amounts of Carbon in Steels. (In Russian.) B. K. Podkorytov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1262.

Method is claimed to have much greater accuracy than the volumetric "barite" method.

10B-6. Carbon and Sulphur; Combustion Technique in the Laboratory. J. Winning. *Iron and Steel,* v. 21, Dec. 1948, p. 615-617.

Problems involved in routine carbon and sulphur determination in iron and steel by the combustion-tube method. Recommendations for best results and alleviation of difficulties.

10B-7. A Review of Methods of Determining Carbon in Steel. Ralph L. Wilson. *American Iron and Steel Institute,* 1948, 7 pages.

Advantages and limitations of the various methods for routine work.

10B-8. A Method of Identifying Manganese-Sulphide Inclusions in Steel. J. H. Whiteley. *Journal of the Iron and Steel Institute,* v. 160, Dec. 1948, p. 365-366.

Describes method using a Selvyt cloth which has been soaked in a solution of silver nitrate and well washed. Typical results.

10B-9. First Report of the Gases and Non-Metallics Sub-Committee. Part I. Introduction. W. W. Stevenson. **Part II. The Determination of Oxygen in Liquid Steel by the Aluminum-Killed Bomb Method.** G. E. Speight. **Part III. The Determination of Hydrogen in Liquid Steel.** G. E. Speight and R. M. Cook. **Part IV. A Cooperative Examination of a Manganese-Molybdenum Steel.** T. E. Rooney. **Part V. A Cooperative Examination of a Nickel-Chromium Steel.** T. E. Rooney. **Part VI. A Co-operative Examination of the Distribution of Non-Metallic Inclusions in Billets From a Mild-Steel Ingot.** T. E. Rooney. *Journal of the Iron and Steel Institute,* v. 160, Dec. 1948, p. 388-415.

Organization and personnel of the subcommittee and abstracts of four papers published under its sponsorship during the past 2½ years. Part II gives results of analysis of bomb samples from acid and basic openhearth practice to determine reproducibilities of gravimetric, nephelometric, and vacuum-fusion methods for oxygen. Examples of bomb tests from acid heats after deoxidation with ferrosilicon, and from comparable Al-killed and nonkilled samples. Part III describes two sampling methods: the "sealed-mold" and "chilled-pencil" techniques. Results for low-alloy openhearth and electric-furnace steels. Parts IV, V, and VI give results of micrographic and X-ray examinations, and oxygen determinations by vacuum fusion, fractional vacuum fusion, Al reduction, and the chlorine and alcoholic iodine residue method.

10B-10. The Absorptiometric Determination of Manganese in Steel. *Metallurgia,* v. 39, Dec. 1948, p. 105-110.

Committee report gives results of an exhaustive investigation of possible variants of two methods for absorptiometric determination of manganese in steel. Superiority of periodate over catalyzed persulfate oxidation having been confirmed, a tentative standard method is formulated.

10C—Nonferrous

10C-1. Solders and Babbitts; Routine Spectrographic Analysis. A. W. Danko and G. W. Wiener. *Analytical Chemistry,* v. 20, Dec. 1948, p. 1178-1182.

A spark spectrographic method for analysis of Pb, Cu, Sb, and Sn in Sn-base solders and babbitts and Pb-Sn solders. The precentage ranges include Cu from 0.10 to 7.50; Sb, 0.10 to 2.50; Pb, 0.10 to 2.00; and Sn in Pb-Sn solders from 25.0 to 70.0. Cu, Sb, and Pb working curves are plotted as log intensity vs. log concentration.

10C-2. Chemistry of Thorium; Quantitative Estimation of Thorium by Precipitation With Radioactive Pyrophosphate. Therald Moeller and George K. Schweitzer. *Analytical Chemistry,* v. 20, Dec. 1948, p. 1201-1204.

10 references.

10C-3. Spectrophotometric Determination of Iron and Titanium in Cathode Nickel. G. Victor Potter and Clarence E. Armstrong. *Analytical Chemistry,* v. 20, Dec. 1948, p. 1208-1209.

Rapid and reproducible method depending upon formation of iron and titanium complexes of disodium 1,2-dihydroxybenzene-3,5-disulphonate.

10C-4. Colorimetric Determination of Rhenium. A. D. Melaven and K. B. Whetsel. *Analytical Chemistry,* v. 20, Dec. 1948, p. 1209-1211.

Method described is aplicable to solutions containing up to 0.9 mg. of Rh in the presence of 1 mg. of Mo in a total volume of 100 ml. The Mo is precipitated from H_2SO_4 by α-benzoinoxime and separated from the rhenium by filtration. The rhenium is determined by forming the rhenium thiocyanate color complex and measuring the transmittance of the solution. 10 ref.

10C-5. Colorimetric Determination of Copper in Tin and Lead-Base Alloys. Milton Sherman. *Iron Age,* v. 162, Dec. 23, 1948, p. 62-63.

New and more rapid method (20 min.) utilizing sodium dimethyl dithiocarbamate as the colorimetric reagent.

10C-6. Electrometric Determination of Nickel and Copper. (In Russian.) V. G. Sochevanov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1255-1256.

Critically analyzes the method proposed by S. K. Chirkova. Indicates that only the sum of the copper and nickel present may be determined by this method and that the basic problem of their direct determination by one test remains as yet unsolved.

10C-7. Determination of Small Amounts of Tin in Alloys; Isolation by Adsorption of Stannic Acid on Manganese Dioxide. (In English.) S. Kuhnel Hagen, Niels Hofman Bang, and Poul Gjertsen. *Acta Chemica Scandinavica,* v. 2, No. 4, 1948, p. 343-351.

On the basis of the fact that colloidal and dispersed antimonic acid is readily adsorbed by manganese dioxide, a convenient and rapid method for the isolation and determination of small percentages of tin was developed.

10C-8. Massanalytische Bestimmung einer Reihe von Metall-Ionen durch Phosphattitration. (Quantitative Determination of a Series of Metal Ions by Phosphate Titration.) Hugo Krause. *Fresenius' Zeitschrift fur Analytische Chemie,* v. 128, Nos. 2-3, 1948, p. 99-106.

A procedure for determining ions of Ba, Sr, Ca, Mg, Al, Cr, Pb, and U.

10C-9. Bleibestimmung durch Umwandlung des elektrolytisch abgeschiedenen Blei IV-oxyds mittels Erhitzens zu Blei II-oxyd. (Determining Lead by Converting Electrodeposited Quadrivalent Lead Oxide Into Trivalent Lead Oxide by Heating.) L. Hertelendi and J. Jovanovich. *Fresenius' Zeitschrift fur Analytische Chemie,* v. 128, Nos. 2-3, 1948, p. 151-158.

Since electrodeposited lead oxide never quite corresponds to the formula PbO_2, the author proposes its reduction to Pb_3O_4 or PbO. Experimental procedure and results.

10C-10. Neuer katalytischer Nachweis von Molybdan. (A New Catalytic Method for Detection of Molybdenum.) Rudolf Lang. *Fresenius' Zeitschrift fur Analytische Chemie,* v. 128, Nos. 2-3, 1948, p. 165-166.

Colorimetric method involving use of methylene blue.

10C-11. Die quantitative Fallung von Blei als basisches Bleisalicylat. (The Quantitative Precipitation of Lead in the Form of Basic Lead Salicylate.) I. G. Murgulescu and Filofteia Dobrescu. *Fresenius' Zeitschrift fur Analytische Chemie,* v. 128, Nos. 2-3, 1948, p. 203-206.

Experimental data.

10C-12. Potentiometrische Titrationen mit Kaliumjodat II. Die potentiometrische Bestimmung des Thoriums. III. Die potentiometrische Bestimmung des Lanthans. (Potentiometric Titration With Potassium Iodate. II. Potentiometric Determination of Thorium. III. Potentiometric Determination of Lanthanum.) G. Spacu and P. Spacu. *Fresenius' Zeitschrift fur analytische Chemie,* v. 128, Nos. 2-3, 1948, p. 226-231.

10C-13. Analytische Untersuchungen uber das Thallium I-Ion. Potentiometrische Bestimmung von Thallium I-Ion als Thallium-Calciumeisencyanid. V. Mitteilung. (Analytical Research on Monovalent Thallium Ions. Potentiometric Determination of Monovalent Thallium Ions as Thallium Calcium Iron Cyanide. Report V.) Raluca Ripan and E. Popper. *Fresenius' Zeitschrift fur Analytische Chemie,* v. 128, Nos. 2-3, 1948, p. 239-241.

10C-14. Bestimmung und Phosphattitration des Kobalt (II)-Ions durch Uberfuhrung in Ammoniumkobalt (II) -phosphat. (Determination and Phosphate Titration of Cobaltous Ions by Converting Them Into Ammonium Cobalt (II)-Phosphate.) Hugo Krause. *Fresenius' Zeitschrift fur Analytische Chemie,* v. 128, Nos. 2-3, 1948, p. 241-248.

Determination of the above alone and in the presence of several other heavy-metal ions.

10C-15. The Determination of Aluminium in Aluminium Bronze. W. T. Edwards. *Analyst,* v. 73, Oct. 1948, p. 556-557.

Interfering metals are either removed or suppressed, and Al is precipitated with 8-hydroxyquinoline solution under carefully controlled conditions. The method was found suitable for both routine and reference work; a single determination takes 2-3 hr.

10C-16. Effect of Melting Conditions on the Spectrographic Determination of Copper in Lead Alloys. L. C. Bannister and R. H. Price. *Journal of the Institute of Metals,* v. 75, Nov. 1948, p. 151-162.

An accurate and convenient method for preparing Pb-Cu alloy standards for spectrographic analysis involves heating the surface of molten metal directly with a coal-gas flame, which dispels the oxide present and enables solid copper to dissolve more rapidly than usual in lead alloys. Preparation of a number of Pb-Sn-Cu and Pb-Sb-Cu alloys is described. Effect of small amounts of Sb on the determination of Cu.

10C-17. Method for the Spectrochemical Determination of Beryllium, Cadmium, Zinc, and Indium in Ore Samples. Graham W. Marks and Betsy M. Jones. *Bureau of Mines,* Report of Investigations 4363, Nov. 1948, 27 pages.

Outline of the method, standard curves, and tables showing results for various ores and effects of constituents of various minerals and compounds on line intensities. 28 ref.

10C-18. La determinazione del manganese nei metalli non ferrosi e nelle loro leghe col metodo al persolfato-arsenito. (Determination of Manganese in Nonferrous and Light Alloys by the Persulphate-Arsenite Method.) Gaetano Gavioli. *La Metallurgia Italiana,* v. 40, Sept.-Oct. 1948, p. 188-191.

Data from a typical determination are compared with those obtained by other methods. Advantages of the method. 16 ref.

10C-19. Isotope Shifts in Uranium Spectra. L. E. Burkhart, George Stukenbroeker, and Sam Adams. *Physical Review,* ser. 2, v. 75, Jan. 1, 1949, p. 83-85.

A study was made of the isotopic shift of U^{238}, U^{235}, and U^{233}. The shift is sufficient to allow quantitative determination of the components of a mixture of the uranium isotopes by routine spectrographic analysis. Comparative values obtained by mass spectrometer and spectrograph.

10D—Light Metals

10D-1. Spektralanalytische Untersuchung von Umschmelzaluminium auf Spuren von Cd, Ni, Pb and Sn. (Spectrographic Analysis of Scrap Aluminum for Traces of Cd, Ni, Pb, and Sn.) W. Seith. *Metall,* Apr. 1948, p. 117-118.

Procedure for determining Cd, Ni, Pb, and Sn in aluminum.

10D-2. Die Anwendung (leitproben-) freier Auswertungsverfahren bei quantitativen spektrochemischen Analysen unter besonderer Beruckichitigung der Untersuchung von Aluminium und dessen Legierungen. (Use of Evaluation Methods not Requiring Standards in Quantitative Spectrochemical Analysis, With Special Reference to the Study of Aluminum and Its Alloys.) H. Moritz. *Metall,* May 1948, p. 150-153.

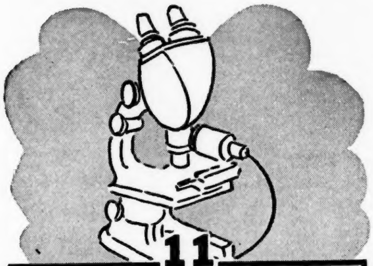
Application of the two-line process to determination of Mg and Si in different Al alloys. Actual experiences show that, under suitable conditions, only one calibration curve for each element being analyzed is necessary.

10D-3. Contributo all 'analisi spettrografica quantitativa del calcio nell 'alluminio e nelle leghe eutettiche Al-Si. (Contribution to the Quantitative Spectrographic Determination of Calcium in Aluminum and in the Eutectic Alloy Al-Si.) T. Nucciari. *Alluminio,* v. 17, Sept.-Oct. 1948, p. 437-443.

Experimental data and optimum

conditions. Results compared with those obtained by other methods.

For additional annotations indexed in other sections, see:
4D-1; 11-21



11 APPARATUS, INSTRUMENTS and METHODS

11-1. A Method of Calibrating Extensometers. W. C. Aber and F. M. Howell. *ASTM Bulletin,* Dec. 1948, p. 33-35; discussion p. 35.

A simple method especially suited for verifying autographic extensometers. The degree of precision is such that the method appears to be entirely satisfactory for verifying strainometers used for determinations of yield strength. Comparison charts enable calibrations to be made very quickly.

11-2. Applications of Reaction Kinetics to Metallographic Problems. G. M. Schwab and G. Petroutsos. *Research,* v. 1, Dec. 1948, p. 717-718.

Previous papers from the authors' laboratory have described the catalytic action of Hume-Rothery alloys in dehydrogenation of formic acid, showing that activation energy of this reaction is related to electron concentration and lattice type. Additional results obtained with six binary alloy systems. Usefulness of the method for alloy research.

11-3. Metallographic Examination of Hot Metal Surfaces. *Iron Age,* v. 162, Dec. 16, 1948, p. 89. Based on article in *Iron and Coal Trades Review,* June 18, 1948.

Use of reflecting microscope. The instrument can be used for photography in both the visible and the ultraviolet regions.

11-4. The Interpretation and Application of Electron-Diffraction "Kikuchi-Line" Patterns. Part II. The Methods of Indexing the Patterns. H. Wilman. *Proceedings of the Physical Society,* v. 61, Nov. 1, 1948, p. 416-430.

Seven methods of indexing electron-diffraction Kikuchi-line patterns from single crystals for the purpose of practical use of such patterns. 11 ref.

11-5. A Technique for Quantitative Determination of Texture of Sheet Metals. John T. Norton. *Journal of Applied Physics,* v. 19, Dec. 1948, p. 1176-1178.

Method using an x-ray unit equipped with a Geiger-Muller counter for measuring intensities. Small rods are cut from the sheet with their axes parallel to the plane of the sheet and making various angles with the rolling direction. With the counter tube set at the correct diffraction angle for the desired crystallographic plane, each rod in turn is placed in the beam and rotated continuously about its axis. The recorder chart, synchronized with the rod rotation, plots a curve of intensity vs. angular position.

11-6. The Application of Electron Multiplier Tubes in the Measurement of X-Ray Beam Intensities and in the Determination of Crystal Structure. G. Papp and K. Sasvari. *Journal of Applied Physics,* v. 19, Dec. 1948, p. 1182-1183.

Outlines the above as developed in Hungary.

11-7. Determination of Surface Tension of Molten Materials; Adaptation of the Pendent Drop Method. James K. Davis and F. E. Bartell. *Analytical Chemistry,* v. 20, Dec. 1948, p. 1182-1185.

A simple and apparently accurate method for the determination of surface tension at elevated temperatures. Surface tension measurements on molten glass, resins, waxes, metals, and metallic oxides. 12 ref.

11-8. Precision Method of Thermal Analysis. R. M. Gruver. *Journal of the American Ceramic Society,* v. 31, Dec. 1, 1948, p. 323-328.

A continuously recording potentiometer, measuring accurately heat effects of from 0.1 to 500° C., is used to determine the differential temperature between a sample and a reference material. The temperature rise is controlled by a continuous voltage-adjustment-type program controller. The sample holder differs from usual ones in that it has low heat capacity, high conductivity, and small mass. 10 ref.

11-9. Thermoelectric Method of Determining the Limit of Solubility of Manganese in Aluminum. (In Russian.) I. L. Rogel'berg and E. S. Shpichinetskii. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1216-1218.

The method, the apparatus used, and results obtained.

11-10. Analyses and Interpretations of X-Ray Diffraction Effects in Patterns

of Aged Alloys. A. H. Geisler and J. K. Hill. *Acta Crystallographica,* v. 1, Nov. 1948, p. 238-252.

Limitations of the various X-ray diffraction methods used to study the structure of aged alloys. A method which employs a stationary single crystal and characteristic radiation is applied to the structures of aged Al-Ag and Al-Mg-Si alloys. Evidence for one- and two-dimensional diffraction is reported for both alloys. Limitation of particle dimensions is proposed as a general explanation of the diffraction effects. 19 ref.

11-11. X-Ray Spectrometer With Geiger Counter for Measuring Powder Diffraction Patterns. J. Bleeksma, G. Kloos, and H. J. Di Giovanni. *Philips Technical Review,* v. 10, July 1948, p. 1-12.

With the spectrometer described, X-ray diffraction patterns are traversed by a Geiger-counter tube detector instead of being recorded on photographic film. Accuracy and resolving power are better than with commonly used photographic methods, under comparable conditions. Additional advantages are claimed.

11-12. Controlled Grain Growth Applied to the Problem of Grain Boundary Energy Measurements. C. G. Dunn. *Journal of Metals,* v. 1, sec. 3, Jan. 1949, p. 72.

Extension of a successful method for growing single crystals of silicon ferrite to predetermined orientations in flat specimens, in which three-grain specimens are made in such a way that the equilibrium common grain boundaries are perpendicular to the surface of the specimen. The angles to be measured then appear as the grain-boundary angles in the surface of the specimen.

11-13. Three-Inch Experimental Cupola. *Pig Iron Rough Notes,* Autumn 1948, p. 18-19.

Fred C. Barbour and W. M. Spradlin of McWane Cast Iron Pipe Co., Birmingham, designed and built midget cupola to study the effect of the various elements in iron upon iron's ability to absorb carbon. It was found to operate in a manner comparable to a much larger cupola.

11-14. Optical Determination of Thin Films on Reflecting Bases in Transparent Environments. A. B. Winterbottom. *Journal of the Optical Society of America,* v. 38, Dec. 1948, p. 1074-1082.

The classical theory of metal and film optics and its implications in connection with various optical methods for studying films and surfaces. An experimental technique for determination of thin films *in situ* from the change produced in the reflection of a polarized wave. Examples of applications. 24 ref.

11-15. Applications of the Photographic Pressure Effect. K. B. Mather. *Journal of the Optical Society of America,* v. 38, Dec. 1948, p. 1065-1067.

Because of their sensitivity to mechanical pressure, photographic emulsions will reproduce accurately surface contours pressed against them. This offers a new method for preparing high-contrast transparent replicas for microscopy. The technique may be applicable to the microscopy of metallurgical and other opaque surfaces.

11-16. Production of Extremely Thin Metal Films by Evaporation on to Liquid Surfaces. Nils Hast. *Nature,* v. 162, Dec. 4, 1948, p. 892-893.

According to the technique described, Be and Al were evaporated onto a thin layer of glycerol on glass. It is thus possible to make films of 10-20A. in thickness, which can be supported on screens having as much as 80% open area. Value of such films in research.

11-17. Tricks With the Supersonic Reflectoscope. Floyd A. Firestone. *Non-Destructive Testing,* v. 7, Fall 1948, p. 5-19.

Unusual techniques include detecting flaws lying near the surface; increasing the strength of high-frequency waves with tinfoil under the crystal; measuring average grain size in metals; the ray-bender; testing of thin sheets; determining residual stress or incipient fatigue beneath a surface; generating shear waves or longitudinal waves by reflection; determining Poisson's ratio, Young's modulus, and the shearing modulus; measuring thickness of a part.

11-18. Technique de l'évaporation des couches minces multiples. (Evaporation Technique for Deposition of Multiple Thin Layers.) Ch. Dufour. *Le Vide,* v. 3, July-Sept. 1948, p. 480-486.

Method for control of the thickness of layers obtained by vacuum evaporation. A process permitting deposition of layers of different substances and of different thicknesses is proposed.

11-19. An Examination of the Thiocyanate Porosity Test for Tinplate. J. Pearson and W. Bullough. *Journal of the Iron and Steel Institute,* v. 160, Dec. 1948, p. 376-380.

The above test was found to require modification. Suggestions are made with respect to preparation of test solutions, cleaning of the specimens, and estimation of dissolved iron. Results indicate that the modified method is suitable for quantitative estimation of the extent of discontinuities in the coating on commercial hot-dipped tinplate.

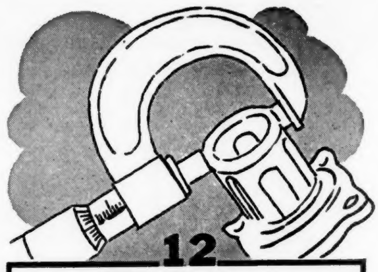
11-20. A Vacuum Furnace High-Temperature Microscopy. D. G. Nickols. *Journal of the Iron and Steel Institute,* v. 160, Dec. 1948, p. 415-416.

Vacuum furnace which permits metal specimens to be examined microscopically at temperatures up to 950° C. incorporates a mica observation window and gaskets of heat-resistant silicone rubber.

11-21 (Book). Practical Spectroscopy. George R. Harrison, Richard C. Lord, and John R. Loofbourow. 573 pages. 1948. Prentice-Hall, 70 Fifth Ave., New York 11, N. Y.

Attempts to give a comprehensive view of the status and possibilities of experimental spectroscopy as it exists today. References to specific points are given as footnotes; at the ends of most chapters appropriate general references are also given.

For additional annotations indexed in other sections, see: 4C-2-5; 7A-17; 8-13



INSPECTION and STANDARDIZATION

12-1. An Investigation of Radiography in the Range from 0.5 to 2.5 Million Volts. W. W. Buechner and others. *ASTM Bulletin,* Dec. 1948, p. 54-64.

Deals with work begun in the summer of 1941 at MIT for the NDRC and Navy Dept. Radiography made it possible to examine the interiors of a variety of heavy explosive weapons, for improvement of our own weapons and determination of the characteristics of captured enemy weapons. Production, absorption, and scattering; application methods; and techniques of high-voltage radiography.

12-2. The Growing Importance of Statistical Methods in Industry. P. L. Alger. *General Electric Review,* v. 51, Dec. 1948, p. 11-17.

Discussion is correlated with a review of the literature. 44 ref.

12-3. How to Make Best Use of Gage Block Accessories. H. J. Chamberland. *Iron Age,* v. 162, Dec. 23, 1948, p. 52-56.

Use of such accessories as the sine bar, surface plates, master flats, master squares, base blocks, adjustable holders, caliper bars, trammel points, and similar items. Advantages, limitations, typical applications, and accuracies.

12-4. Radiography as a Foundry Tool. J. B. Caine. *Foundry,* v. 77, Jan. 1949, p. 68-69, 180-181, 184, 186.

Attempts to debunk the belief of the "average foundryman" that radiography is too expensive and also too sensitive in that it will cause rejection of castings otherwise perfectly acceptable. How radiography can best be applied in the average foundry.

12-5. Lamination Detection; Routine Examination of Aluminium Sheet by Ultrasonic Radiation. H. R. Clayton and N. D. G. Mountford. *Metal Industry,* v. 73, Dec. 3, 1948, p. 443-447.

Apparatus designed for the detection of laminations in aluminum sheet under production conditions.

12-6. Quality Control; An Ultra-Simplified Method of Chart-Construction and Use. H. Howell. *Aircraft Production,* v. 10, Dec. 1948, p. 404-405.

The method described eliminates the customary arithmetic without affecting statistical precision. It is simply that of tabulating for ready reference pre-calculated values of all the required statistical data. Illustrated by a typical example.

12-7. A Discussion of Modern Quality Control Techniques. C. W. Kennedy. *American Society of Mechanical Engineers,* Advance Copy, Paper No. 47-A-65, 1947, 21 pages.

12-8. Testing and Inspection of Wire Ropes. James Gee. *Mine & Quarry Engineering,* v. 14, Dec. 1948, p. 375.

Use of the Cyclograph, which combines application of tension with magnetic analysis.

12-9. Zerstorungsfreie Werkstuckpru-

fung. (Non-Destructive Methods of Testing Materials.) F. Rohner. *Schweizer Archiv fur angewandte Wissenschaft und Technik,* v. 14, Oct. 1948, p. 289-293.

X-ray, electrical, magnetic, and ultrasonic methods.

12-10. Evaluating Quality With the "Standard Deviation". Clifford W. Kennedy. *Tool Engineer,* v. 22, Jan. 1949, p. 26-28.

Statistical procedures, illustrated by application to a particular part.

12-11. Inspection With Ultrasonic Waves. A. E. Rylander. *Tool Engineer,* v. 22, Jan. 1949, p. 29-32.

Procedures and equipment.

12-12. Why Taper Threads Don't Fit. W. E. Burndrett. *American Machinist,* v. 93, Jan. 13, 1949, p. 95-99.

From years of experience with rotary tool joints, the author says that accurate gages do not insure interchangeable pins and boxes. While offering no solution, he does outline possible errors in taper-threaded products.

12-13. Quality Control in the Manufacture of Basic Steels. Hubert C. Swett. *American Iron and Steel Institute,* 1948, 9 pages.

Procedures of Bethlehem Pacific for products varying from ordinary merchant-bar quality to products requiring very carefully controlled properties for specific uses.

12-14. The Standardization and Simplification of Steel Products. J. G. Morrow and L. H. Winkler. *American Iron and Steel Institute,* 1948, 19 pages.

Development of standards, including what was accomplished during World War II. Savings thus made possible.

12-15. Non-Destructive Testing and Its Place in the Current and Prospective Navy Programs. R. H. Lambert. *Non-Destructive Testing,* v. 7, Fall 1948, p. 20-21.

12-16. Non-Destructive Testing of Drill Pipe. Robert C. McMaster. *Non-Destructive Testing,* v. 7, Fall 1948, p. 27-33.

Causes of drill-pipe failures, recommended drilling techniques and inspection procedures, typical defects and frequency of their occurrence, and economics of drill-string inspection. 26 ref.

12-17. Remarks on the Precision of the Optical Spherometer. Bohumil Jurek. *Microtecnic* (English Edition), v. 11, Oct. 1948, p. 215-221. Translated from the French.

Experimental and theoretical study of precision of the above instrument for measurement of the radius of curvature of spherical surfaces.

12-18. Gauging of Precision Screw Threads—Internal Threads. A. C. Pruliere. *Microtecnic* (English Edition), v. 11, Oct. 1948, p. 222-228. Translated from the French.

The various instruments and techniques for inspection and measurement, their advantages and disadvantages. (To be continued.)

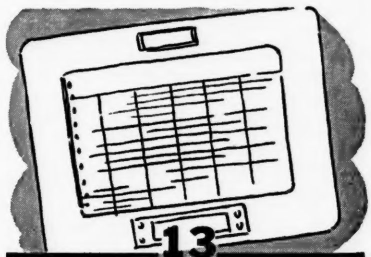
12-19. High Standard of Production Attained With Statistical Quality Control. Julian K. Miller. *Production Engineering & Management,* v. 23, Jan. 1949, p. 45-48.

Applications at Reo Motors, Inc.

12-20. (Book). **Precision Measurement.** Jack Johnson. 181 pages. Pitman Publishing Corp., 2 West 45th St., New York 19, N. Y. $3.00.

Mathematical calculations for checking precision inspection of complex parts. Problems are carried through step by step, and cover checking of tapers, dovetail angles, relief on dies, the two- and three-wire method of checking threads, measuring radii, locating holes for index-plates, and many other jobs.

For additional annotations indexed in other sections, see:
2B-14; 8-4; 11-17; 21A-2



TEMPERATURE MEASUREMENT and CONTROL

13-1. Temperature Control. I. Principles and Practices for Die-Casting Dies. H. K. Barton. *Metal Industry,* v. 73, Dec. 10, 1948, p. 463-466; Dec. 17, 1948, p. 491-493; Dec. 24, 1948, p. 503-506.

Methods of modifying and controlling die temperature for maximum output. Methods for obtaining the necessary heat transfer. Heat dissipation from cores, control of cavity temperature by the use of inserts, and electrical heating of dies.

13-2. A Method of Constructing Cu-Constantan Thermocouples. Howard J. Carter. *Review of Scientific Instruments,* v. 19, Dec. 1948, p. 917-918.

Technique using electroplating instead of welding or soldering, which is applicable to very small wires required for certain work.

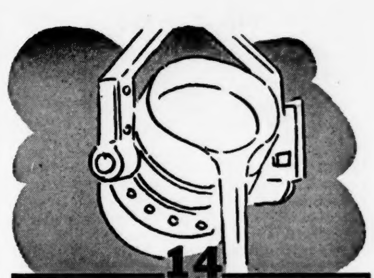
13-3. A Radiation Pyrometer for Low Temperatures. F. E. Hessey. *Steel Processing,* v. 34, Dec. 1948, p. 644-648.

Construction, operation and applications of above instrument made by Brown Instrument Co., and applicable to the 100-600° F. range. Requires reasonably high emissivity. Polished metals usually have too low an emissivity for satisfactory application to them.

13-4. Built-In Controls for Pressure and Temperature. Frank E. Reeves. *Electrical Manufacturing,* v. 43, Jan. 1949, p. 105-109, 186, 188, 190, 192.

Factors discussed aid in selecting the best control when control of pressure or temperature is essential for best performance.

For additional annotations indexed in other sections, see:
11-8



FOUNDRY PRACTICE

14A—General

14A-1. On Accuracy of Sieve Analyses Made by Means of Sieving Machines. Sture Mörtsell. *Transactions of the Royal Institute of Technology,* No. 17, 1948, 43 pages.

Tests on various sets of sieves and sieving machines in the light of American and German standards. Important factors to be considered in sieve analyses. Emphasizes applications to foundry practice.

14A-2. Investment Castings Reproduce Accurate Details. Pat Dwyer. *Foundry,* v. 77, Jan. 1949, p. 98-99, 232.

Use of process for production of ornamental or artistic articles from metal in intricate detail.

14A-3. A Moulding and Core-Sand Development. W. Bullock and J. Finlay. *Foundry Trade Journal,* v. 85, Nov. 18, 1948, p. 481-482.

Describes use of pitch-bonded sands, for which cost and technical advantages are claimed, as well as reduction in fumes produced as compared with oil-bonded sand.

14A-4. Sealing Porous Castings. *Machinery Lloyd* (Overseas Edition), v. 20, Dec. 4, 1948, p. 103.

Use of vacuum-impregnation system, the pores being filled with resin.

14A-5. Developments in American Foundry Equipment. W. A. Turner. *Foundry Trade Journal,* v. 85, Nov. 25, 1948, p. 509-512.

14A-6. Adequate Dust Control for Foundries. B. F. Postman. *Heating and Ventilating,* v. 45, Dec. 1948, p. 65-70.

First of two-part article discusses the dust-control problem in a foundry, first from the standpoint of foundries in general and, second, from the standpoint of problems related to specific types and sizes of foundries.

14A-7. Mechanization Boosts Westinghouse Foundry Capacity. A. D. Stout, Jr. *Iron Age,* v. 163, Jan. 13, 1949, p. 54-57.

New equipment and procedures.

14A-8. Olivine Synthetic Moulding Sand Controls Silicosis. George Allen. *Canadian Metals and Metallurgical Industries,* v. 12, Jan. 1949, p. 19, 36.

Use instead of quartz sand, as developed in Norway.

14A-9. L'évolution du masselottage en fonderie; Solutions nouvelles. (Evolution of Feeder-Head Design for the Foundry; A New Solution.) Pierre Nicolas. *Fonderie,* Sept, 1948. p. 1293-1298.

The best solution of the problem can be achieved by a combination of surface heating by means of an exothermic substance and use of an exothermic core, thus permitting a decrease in feeder-head dimensions. 10 ref.

14B—Ferrous

14B-1. Mechanization Triples Foundry Capacity. R. W. Anderson. *Foundry,* v. 77, Jan. 1949, p. 70-73.

Equipment and procedures of gray-iron foundry of National Sewing Machine Co.

14B-2. Research at American Steel Foundries. Edwin Bremer. *Foundry,* v. 77, Jan. 1949, p. 94-97, 174, 176, 178.

Research equipment and problems worked on. The firm does not engage in pure research, as such, but is concerned principally with development of improved products and improved foundry methods.

14B-3. Steel Castings for Aircraft. E. J. Brown and F. Rodgers. *Foundry Trade Journal,* v. 85, Nov. 18, 1948, p. 475-480; Nov. 25, 1948, p. 501-504; discussion, p. 505-507.

Problems involved in the production of complicated components. Experimental data. Effects of aluminum.

14B-4. Pattern and Core Equipment. *B.S.F.A. Bulletin,* v. 1, Jan. 1949, p. 1-7.

Use in manufacture of steel castings.

14B-5. Oxygen Enrichment of the Cupola Air Blast. *Pig Iron Rough Notes,* Autumn 1948, p. 13-15.

Use at Harrison-Corry Co., Knoxville, Tenn. The oxygen is not added continuously, but used intermittently whenever the temperature of the iron has been lowered due to various causes.

14B-6. Investigation on Dissolved Gases in Cast Iron. (Continued.) J. E. Hurst. *Pig Iron Rough Notes,* Autumn 1948, p. 27-30.

Influence of dissolved gases on soundness. Types of defects obtained with sands having different properties and moisture contents, and at different casting temperatures.

14B-7. Replacement Castings; Some Jobbing Foundry Methods. Tubal Cain. *Iron and Steel,* v. 21, Dec. 1948, p. 613.

Method for producing a combined flywheel and clutch race as a replacement for a broken part, without use of a pattern, in order to speed the job.

14B-8. Steel Die Castings Produced Successfully. Robert B. Stanton. *American Machinist,* v. 93, Jan. 13, 1949, p. 118-119.

Steel die castings are now produced commercially by a combination of tungsten-carbide lined injection cylinders, an induction furnace, and silicone die lubricants.

14B-9. Patterns and Molding Methods for Steel Castings. John Howe Hall. *Foundry,* v. 77, Jan. 1949, p. 76-79, 208, 210-213.

Molding with cement-bonded sand and handling of large cored work.

14C—Nonferrous

14C-1. Modern Methods of Die Casting. H. L. Harvill. *Western Metals,* v. 6, Dec. 1948, p. 30-33.

Methods and equipment.

14C-2. Conserving Raw Materials. Hiram Brown. *Foundry,* v. 77, Jan. 1949, p. 80-81, 219-222.

Recommended procedures.

14C-3. Bronzes—Old and New. J. F. Buchanan. *Foundry,* v. 77, Jan. 1949, p. 196-198, 200.

The various bronzes, their compositions, methods of casting, properties, and applications.

14C-4. Pulverized Vermiculite Has Foundry Applications. Tony Willcox. *Refractories Journal,* v. 24, Nov. 1948, p. 402.

Uses as inhibitor, core wash, or refractory facing for permanent molds in the nonferrous foundry.

14C-5. American Brake Shoe Making Steel Plant Castings in New Plant. *Blast Furnace and Steel Plant,* v. 36, Dec. 1948, p. 1472-1474, 1488.

Nonferrous foundry of National Bearing Div., American Brake Shoe Co., makes miscellaneous nonferrous castings used in steel plants.

14D—Light Metals

14D-1. Induction Melting and Improved Technique Increase Rotor-Casting Efficiency at Reliance Electric's Ashtabula Plant. *Industrial Heating,* v. 15, Dec. 1948, p. 2080, 2082, 2084, 2086, 2088, 2176, 2178.

Facilities of America's first motor manufacturer to successfully pressure-cast aluminum rotors as large as 30 in. in diameter.

14D-2. Model Foundry Controls Aircraft Castings. Paul Graham. *Western Machinery and Steel World,* v. 39, Dec. 1948, p. 80-83, 107.

Experimental aluminum foundry of North American Aviation at Inglewood, Calif.

14D-3. Aluminum Alloy Pressure Moldings. James L. Erickson. *Aero Digest,* v. 58, Jan. 1949, p. 46-47, 86.

Various parts pressure molded by cold-chamber machines. Their complex nature illustrates cost savings over machined parts. Comparative mechanical properties.

14D-4. Aluminum Cast in Plaster. *SAE Journal,* v. 57, Jan. 1949, p. 60-61. Based on "Relation of the Antioch Process to the Foundry," by E. A. Canning.

Plaster-mold process used to cast Allison aircraft-engine parts and elements of the Buick Dynaflow transmission. It is similar to the wax-and-plaster process developed at Antioch College, but uses gypsum as the basic raw material, mixed with sand, asbestos, talc, and sodium silicate. The process is expensive and should be used in producing parts of complicated design which cannot be made more economically by other methods.

14D-5. Einfluss der Absenkgeschwindigkeit beim Wassergussverfahren auf die Eigenschaften der Stränge und der daraus hergestellten Bleche. (Effect of Cooling Rate During Water-Cooled Casting on Properties of Bars and Sheets Rolled From Them.) Hans Bothmann and Hugo Vosskuhler. *Zeitschrift fur Metallkunde,* v. 39, Jan. 1948, p. 13-17.

Effects of cooling on the properties of Al-Cu-Mg alloys when the molds were submerged in water at rates varying from 4 to 12 cm. per min. were studied. Results show that the increased rate of cooling increases the tensile strength and yield point, but decreases the elongation. The higher rate of immersion also had a favorable effect on rolling process.

14D-6. Melting and Casting Titanium. *Iron Age,* v. 163, Jan. 13, 1949, p. 58-59, 107.

Reviews proceedings of recent symposium in Washington.

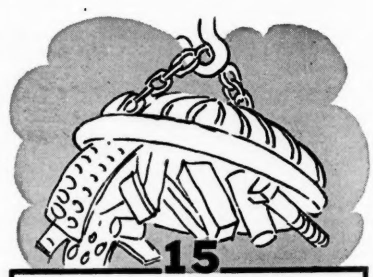
14D-7. Light Alloy Castings. *Metallurgia,* v. 39, Dec. 1948, p. 94-96.

A number of examples.

14D-8. (Book). **La Fonderie des Alliages Légers.** (The Light Alloy Foundry). R. Perret. Dunod, 92 Rue Bonaparte, Paris 6, France. 680 fr.

Preparation of the virgin metal and classification of foundry alloys. Studies of the Al-Cu, Al-Si, Al-Zn, and other light alloys. The chapter devoted to the subject of control is thoroughly practical and can be recommended for study. After a survey of melting practice, which includes information on alterations arising in melting due to gas absorption and the like, there is a chapter on heat treatment. Finally, 35 pages are devoted to defects and their cure. (From review in *Foundry Trade Journal.*)

For additional annotations indexed in other sections, see:
4D-2; **7A**-12; 12-4; 13-1; **16D**-1; **24B**-2



15 SCRAP and BYPRODUCT UTILIZATION

15-1. Developing a Waste Disposal Process; Examples From the Copper and Brass Industry. Harding Bliss. *Chemical Engineering Progress.* (Transactions Section), v. 44, Dec. 1948, p. 887-894; discussion, p. 894.

The problem is treated from the general point of view, illustrated by a description of methods developed for recovery of useful products from brass-plant pickle liquors. 35 ref.

15-2. The Scrapmen. *Fortune,* v. 39, Jan. 1949, p. 86-91, 134, 136-139.

Personalities and units of the scrap-metal industry and its mode of operation.

15-3. New Technique for Waste Pickle Liquor Neutralization. Richard D. Hoak and Charles J. Sindlinger. *Industrial and Engineering Chemistry,* v. 41, Jan. 1949, p. 65-70.

Technique whereby substantial reduction in sludge volume is effected, settling is complete in less than an hour, and the vacuum filtration rate is increased markedly. It has been applied to magnesia, high-calcium lime, and dolomitic lime.

15-4. Secondary Aluminum Outlook for 1949. Carl H. Burton. *Metals,* v. 19, Dec. 1948, p. 11-12.

"Conversion deals" are harmful to industry and encourage runaway prices; stresses need of proper segregation of scrap.

15-5. The Treatment of Spent Pickle Liquor. N. Swindin. *Proceedings of the Chemical Engineering Group, Society of Chemical Industry,* v. 26, 1944, p. 56-69; discussion, p. 69-71.

Theory and practice. 61 ref.

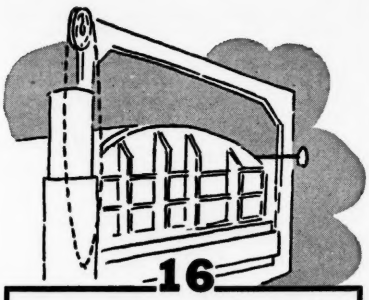
15-6. Control of Liquid and Airborne Wastes from Porcelain Enameling. Hubert S. Kline. *Finish,* v. 6, Jan. 1949, p. 47-49, 52.

The various problems involved.

15-7. Oxygen and Acetylene Gas Distributing System Used Effectively in Large Scrap Preparation Yard. John S. Gray. *Steel,* v. 124, Jan. 10, 1949, p. 60-61.

Procedure at Calumet Iron & Supply Co., East Chicago, Ind.

For additional annotations indexed in other sections, see:
2A-2



16 FURNACES and HEATING DEVICES

16A—General

16A-1. The Fundamentals of Industrial Furnace Design and Operation. Herbert Southern. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 77-92; discussion p. 130-133.

Theory and mathematics.

16A-2. Aerodynamics in Relation to Furnaces. A. H. Leckie. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 112-116; discussion, p. 130-133.

Study of the flow of gases in large furnaces, especially reversing regenerative types.

16A-3. Recuperation in Relation to Furnaces. C. H. Williams. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 122-125; discussion, p. 130-133.

Advantages; possible savings for different types and temperatures.

16A-4. Remarks on Electric Furnaces. A. Glynne Lobley. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 129-130; discussion, p. 130-133.

Ways to achieve greater economy in consumption of energy in use of the above in metallurgical industries.

16A-5. Liquid Fuel for High Temperature Processes. T. C. Bailey, F. J. Battershill, and R. J. Bressey. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 162-174; discussion, p. 182-185.

Data on properties and combustion characteristics, including some for openhearths converted from gas to oil.

16A-6. Le probleme des creusets du four a haute fréquence. (The Problem of Crucibles for High-Frequency Furnaces.) F. M. Bosch and H. Haemers. *Revue de Métallurgie,* v. 45, Sept. 1948, p. 312-316.

Factors involved in the above such as composition of material, design, wall thickness, etc. Optimum physical and chemical properties of the material, as well as its method of production.

16A-7. Kernprobleme des Energieumsatzes am grossen elektrischen Schmelzofen. (Basic Problems of Energy Exchange in Large Electric Melting Furnaces.) J. Wotschke. *Schweizer Archiv fur angewandte Wissenschaft und Technik,* v. 14, Oct. 1948, p. 299-306.

Shows that the center of energy exchange is concentrated in certain zones of "power flow". A large melting furnace is used to explain the method of determining its position and magnitude.

16A-8. Heat Application; Needs in Furnace Development and Fuel Utilization for the Metal Industry. F. E. Harris. *Iron and Steel,* v. 21, Dec. 1948, p. 629-632. Based on article in *Industrial Heating.*

16A-9. Air Circuit for Furnace Control. W. J. Schupner. *Applied Hydraulics,* v. 1, Jan. 1949, p. 25, 27.

Use of compressed air to operate conveyor furnace for annealing.

16A-10. Utilisation de l'énergie solaire. (Utilization of Solar Energy.) Félix Trombe, Marc Foex, and Charlotte Henry la Blanchetais. *Journal des Recherches du Centre National de la Recherche Scientifique,* Nos. 4-5, 1948, p. 61-89.

Variation in available solar energy for different locations in France and elsewhere throughout the year. French experimental furnace capable of producing temperatures above 5000° C., experiments in which metals and refractory oxides were melted. 12 ref.

16A-11. Progres et développements de la méthode de détermination des flux de chaleur sur modele électrique. (Progress and Development of a Method for Determination of Heat Flow by Electrical Models.) E. Bonnier. *Verres et Réfractaires,* v. 2, Oct. 1948, p. 288-292.

The experimental method proposed by Beuken and its present state of development. Theoretical bases and new applications. 17 ref.

16A-12. Protective Atmospheres in Industry. Part II. A. G. Hotchkiss and H. M. Webber. *General Electric Review,* v. 51, Dec. 1948, p. 41-48.

Theoretical considerations involving chemical reactions occurring in the principal types of gases commonly used as furnace atmospheres. (To be continued.)

16A-13. (Book). **Fuel and the Future. Vols. I, II, and III,** 370, 374, and 211 pages. 1948. H. M. Stationery Office, London, England.

Proceedings of a conference held in London, Oct. 8-10, 1946. The papers and accompanying discussion deal with both research and practical procedures, with emphasis on fuel savings. Among the topics dealt with are: generation of steam (locomotives, boilers, stokers, etc.); steam utilization in various industries; heat for drying in industry and agriculture; factory heating and air conditioning; high-temperature processes (metallurgical and ceramic firing; the gas producer); carbonization and the coke, gas, and chemical industries; coal cleaning, sizing, and grading; and domestic heating (architectural design, insulation, heating appliances, and district heating).

16B—Ferrous

16B-1. Walking Beam Furnace Keeps Spring Leaves Aligned as They are Heated. *Industrial Heating,* v. 15, Dec. 1948, p. 2112, 2114.

New furnace specifically designed and built to heat spring leaves prior to forming.

16B-2. Problems in Fuel Efficiency. C. Hulse and R. J. Sarjant. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 5-29; discussion, p. 74-76.

Problems relating to the efficient use of fuel in the iron and steel industry; possible solutions and lines of approach for future developments. 16 ref.

16B-3. Fuel Utilization in Iron and Steel Works. N. H. Turner and F. A. Gray. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 30-38; discussion, p. 74-76.

Discusses the above on the basis of results obtained at a certain British works.

16B-4. Factors Controlling Furnace Ef-

ficiency in the Steel Industry. H. C. Armstrong. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 111-112; discussion, p. 130-133.

16B-5. Gas Producers in the Iron and Steel Industry. F. A. Gray. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 139-140; discussion, p. 150-161.

Operating procedures.

16B-6. Use of Oil in Open-Hearth Steel Furnaces. W. F. Cartwright. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 174-176; discussion, p. 182-185.

Advantages.

16B-7. Oil Firing in the Ferrous Metals Industry. A. Stirling. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 176; discussion, p. 182-185.

Discussed on the basis of actual experience.

16B-8. Coal Preparation for the Production of Coke to be Used in a 2000 Ton Blast Furnace. E. J. Gardner. *Blast Furnace and Steel Plant,* v. 36, Dec. 1948, p. 1463-1464.

Methods used by Inland Steel. Comparative data for hand loaded and machine loaded coal.

16B-9. Lustron Furnaces Have "Ware Silhouettes", Traveling Thermocouples and "Kinetic Air Plugs", *Finish,* v. 6, Jan. 1949, p. 41.

Two unusual features of above porcelain-enameling furnaces: In combination with an electric-eye arrangement the "silhouette" prevents improperly hung porcelain enameled ware from entering the furnace by stopping the conveyor-chain when a light beam is broken. A traveling-thermocouple arrangement measures ware temperatures simultaneously at three horizontal levels. The temperature curves are electronically recorded.

16C—Nonferrous

16C-1. Fuel Considerations in the Fabrication of Non-Ferrous Metals and Light Alloys. Leslie Aitchison. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 38-40; discussion, p. 74-76.

A comprehensive survey of factors affecting the efficient use of fuel in those copper and brass industries concerned with the manufacture of wrought goods, and similarly for wrought aluminum and Al alloys. The operation of furnaces, either for melting or for reheating, annealing, hot rolling, forging or extrusion; considers fuel consumption in heating and lighting.

16C-2. Fuel Efficiency in the Brass Foundry Pays Dividends. G. L. Harbach and F. Hudson. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 40-46; discussion, p. 74-76.

Reviews work of Association of Bronze and Brass Founders and results achieved in connection with fuel economy; comparative data on coke and oil-fuel melting; examples of further economies which may be achieved in the future.

16C-3. Furnace Design in the Non-Ferrous Metal Industry. F. C. Ashen. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 125-128; discussion, p. 130-133.

Design of the various types, indicating where improvements are most needed.

16C-4. The Gas Producer in the Non-Ferrous Industry. Leslie Aitchison. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 146-148; discussion, p. 150-161.

Reasons for limited use of the above.

16C-5. Oil Fuel for Non-Ferrous Metals. J. Sykes. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 177-178; discussion, p. 182-185.

Applications and advantages.

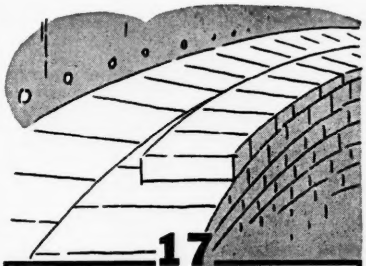
16D—Light Metals

16D-1. Low-Frequency Melting; Twin Hearth Induction Furnace for Light Alloys. H. Capitaine. *Metal Industry,* v. 73, Dec. 17, 1948, p. 489-490.

Furnace which combines advantages of maximum output with minimum of attendance and low power consumption.

For additional annotations indexed in other sections, see:

2B-3; 2C-2; 7B-8; 19B-1; 22B-13-14



17 REFRACTORIES and FURNACE MATERIALS

17-1. Some Considerations in the Use of Carbon Refractories in Blast Furnaces. W. S. Debenham. *Industrial Heating,* v. 15, Dec. 1948, p. 2168, 2170-2174, 2202. A condensation.

Previously abstracted from *Steel.* See item 17-67, 1948.

17-2. Silica and Fire Clay Refractories for Steel Plant Furnaces. C. A. Brashares. *Iron and Steel Engineer,* v. 25, Dec. 1948, p. 49-51; discussion, p. 52-53.

Claims that super-duty silica brick should give 15-25% increased life in sprung roofs on account of its higher melting point, higher refractoriness, and high mechanical strength.

17-3. Applications of Super-Refractories Made From Electric Furnace Products. Charles F. Geiger, Arthur A. Turner, and Otto R. Stach. *Chemical Engineering Progress* (Transactions Section), v. 44, Dec. 1948, p. 933-936.

Applications of silicon carbide, alumina, mullite, and also some new compositions consisting mainly of alumina.

17-4. New Alumina-Silica Refractories. G. Bickley Remmey. *Chemical Engineering Progress* (Transactions Section), v. 44, Dec. 1948, p. 943-946.

Properties and applications of different commercial varieties. Experimental and service results obtained in both glass and metallurgical furnaces.

17-5. Upper Useful Limits of Commercial Superrefractories. G. Bickley Remmey. *American Ceramic Society Bulletin,* v. 27, Dec. 15, 1948, p. 477-485.

Eighteen different brands of fabricated mullite and alumina refractories, as well as one zircon and one zirconia brick, were tested to determine their upper limits. The temperatures at which zircon and zirconia react with mullite and alumina.

17-6. The Selection and Use of Hot-Face Insulating Bricks. L. R. Barrett. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 93-98; discussion, p. 130-133.

Pros and cons of use of insulating bricks on various locations of openhearth furnaces. Properties of British hot-face insulating bricks; heat transmission.

17-7. The Selection of Refractory Materials in Relation to Fuel Economy. G. R. Rigby. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 99-111; discussion, p. 130-133.

Selection of refractory materials other than insulating products. How properties of these materials can influence fuel requirements.

17-8. Insulation From the Manufacturer's Standpoint. A. E. Hubbard. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 118-122; discussion, p. 130-133.

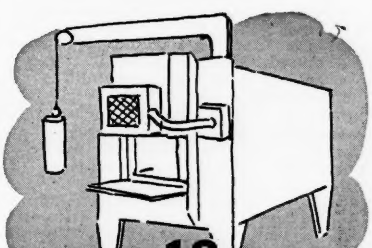
Advantages for large inudstrial furnaces, and some of the difficulties—mostly psychological—in securing its acceptance.

17-9. Refractory Materials for Reheating Furnaces. Advantages of Plastic-Chrome Construction. H. Parnham. *Refractories Journal,* v. 24, Nov. 1948, p. 391-401. Reprinted from *Iron and Coal Trades Review.*

Economic operation of reheating furnaces largely depends upon the life of the refractory material used in the hearth. Problems associated with the use of various refractory materials upon which steel ingots, bars, plates, blanks, and blooms are heated; methods by which some of the problems described may be overcome.

For additional annotations indexed in other sections, see:

2B-6; 14C-4



18 HEAT TREATMENT

18A—General

18A-1. Which Atmosphere for Heat Treating and Brazing? C. E. Peck. *American Machinist,* v. 93, Jan. 13, 1949, p. 90-94.

Eight representative controlled atmospheres for furnaces are discussed with respect to compositions, properties, and specific applications.

18B—Ferrous

18B-1. Temper Brittleness of Plain Carbon Steels. Leonard D. Jaffe and Donald C. Buffum. *Metals Technology,* v. 15, Dec. 1948, TP 2482, 6 pages.

It is suggested that: plain carbon steels are susceptible to temper brittleness; that temper brittleness develops so rapidly in these steels that even drastic quenching from high temperatures is insufficient to suppress it; and that alloying elements retard the rate of development of temper brittleness. Limited experimental results support this hypothesis, which is contrary to previous theories. 13 ref.

18B-2. Selective Surface Hardening. *Western Machinery and Steel World,* v. 39, Dec. 1948, p. 87.

The "Flamatic" surface hardener and some of its applications.

18B-3. Control of Quality of Heat Treatment of Chromium-Nickel-Vanadium Steel Products by Magnetic Means. (In Russian.) M. N. Mikheev, P. N. Zhukova, and A. P. Voroshilova. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1210-1216.

The relationship of magnetic and electrical properties of the above steels to annealing and quenching temperatures was studied. On the basis of experimental results, the possibility of control of quenching and annealing on the basis of changes in their magnetic or electric properties was established.

18B-4. Determination of the Critical Rate of Quenching Under Factory Laboratory Conditions. (In Russian.) I. F. Afonskii. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1267-1268.

A method of approximate determination on the basis of dilatometric curves. This method seems sufficiently accurate for all practical purposes.

18B-5. Heat Treatment of Tool Steels. E. J. Pavesic. *Tool & Die Journal,* v. 14, Jan. 1949, p. 50, 52-54.

Successful heat treatment of tool-steel involves the tool designer, the tool-steel manufacturer, and the heat treater. Full cooperation can lessen the problems of all three.

18B-6. La préparation des Atmosphères de cémentation gazeuse en France. (Preparation of Atmospheres for Case Hardening in France.) J. Pomey and M. Chateau. *Revue de Métallurgie,* v. 45, Sept. 1948, p. 323-342.

A comprehensive study with particular reference to methods used in France. Theoretical cases of the process and factors involved are analyzed. Methods used in foreign countries and the possibilities of their application in France.

18B-7. Sur les problemes relatifs a la carburation et a la décarburation de l'acier. (Problems Related to the Carburization and Decarburization of Steel.) F. E. Harris. *Revue de Métallurgie,* v. 45, Sept. 1948, p. 347-355.

Factors controlling the diffusion of carbon into steel were evaluated experimentally. On the basis of the results, diagrams of "concentration-penetration" and depth of penetration vs. time are plotted. Method of investigation and apparatus.

18B-8. Heat Treatment of Tool and Die Steels. Peter Payson. *Machinery* (American), v. 55, Jan. 1949, p. 162-166.

First of three articles describes heating cycles for five typical tool steels and results obtained.

18B-9. Selective Hardening Automobile Camshafts. *Steel,* v. 124, Jan. 10, 1949, p. 62.

18B-10. Metallurgy and Heat Treatment of Cutting Tools. P. Leckie-Ewing. *Iron Age,* v. 162, Dec. 30, 1948, p. 28-33; v. 163, Jan. 13, 1949, p. 60-64.

Problems encountered in selection of steel and in the development of optimum heat treatment cycles. Inspection and testing, and factors such as hardenability, hardness, toughness, and grain size. Means of temperature and atmosphere control, and special treatments such as refrigeration, nitriding, and chromium plating.

18B-11. Heat Treatment of Forgings and Die Blocks at A. Finkl & Sons Co. Part I. *Industrial Heating,* v. 15, Dec. 1948, p. 2068-2070, 2072, 2074, 2076, 2078, 2200.

Equipment and procedures of Chicago firm. (To be continued.)

18B-12. Surface Hardened Stainless Steels. Vincent T. Malcolm. *Product Engineering,* v. 20, Jan. 1949, p. 84-87.

Applications of stainless steels to parts that must resist wear and corrosion are extended by a surface hardening process known as Malcomizing. Details of the process and its effect on materials.

18B-13. Isothermal Heat Treating: A Compilation. F. R. Morral. *Wire and Wire Products,* v. 24, Jan. 1949, p. 39-47.

T-T-T diagrams may be drawn for many of the nearly 500 steel compositions assembled. (To be concluded.)

18B-14. (Book). **Electroplating in the Heat Treatment of Steel.** (In Russian.) A. M. Yampol'skiy. 80 pages. 1946. MASHGIZ (State-Scientific Publishing Co. for Machine-Construction Literature), Svendlovsk-Moscow, U.S.S.R.

The production of coatings intended to protect portions of the surface of steel parts during case-hardening and nitriding. Copper plating to 0.012-0.015 mm. is the method commonly used. In addition to giving compositions of plating baths and other solutions, particulars of plant, and operating conditions, it also includes recommendations for controlling the baths and for inspection and treatment of plated parts.

18D—Light Metals

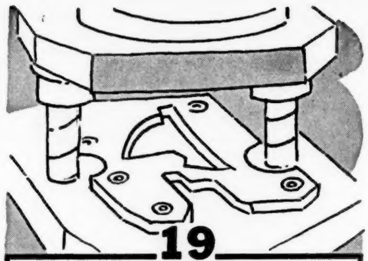
18D-1. Uber die Weiterentwicklung des Heterogenisierungs-Verfahrens von Al-Mg-Legierungen zur Verbesserung der Spannungskorrosionsbeständigkeit. (Further Development of Heterogenization of Al-Mg Alloys For the Purpose of Increasing Stress-Corrosion Resistance.) G. Siebel and G. H. Voss-Kuhler. *Metall,* May 1948, p. 141-146.

An improved method consists of aging at 100-200° C. of strongly cold worked sheet metal mainly in the range of recrystallization, so controlled that only the first stages of recrystallization take place and so that the intermetallic Al_3Mg_2 crystals segregate in coagulated form. Micrographs, and X-ray diffraction and X-ray photographs.

18D-2. Uber den Einfluss der Abschreckgeschwindigkeit auf das Spannungskorrosionsverhalten von Aluminium-Kupfer-Magnesium und Aluminium-Zink-Magnesium-Legierungen. (The Effect of Quenching Rate on the Stress-Corrosion Properties of Aluminum-Copper-Magnesium and Aluminum-Zinc-Magnesium Alloys.) Gustav Siebel. *Zeitschrift fur Metallkunde,* v. 39, Feb. 1948, p. 57-64.

Effects of heat treatment, quenching medium, and quenching rate. 13 ref.

For additional annotations indexed in other sections, see:
4D-6; 10A-18



19 WORKING

19A—General

19A-1. The Handling of Webs and Monofilament Materials. Part II. C. A. Litzler. *Wire and Wire Products,* v. 23, Dec. 1948, p. 1131-1133, 1176.

Equipment for handling strand and monofilament materials during processing, such as extrusion forming; extrusion jacketing of wire; and dipping impregnation or coating.

19A-2. The Y-Cold Strip Mill. A. I. Nussbaum. *British Steelmaker,* v. 14, Dec. 1948, p. 571-573.

Design and merits of the above, with its small diameter rolls.

19A-3. Designing of "Trouble-Free" Dies. Part LXXXVIII. Drawing Presses. C. W. Hinman. *Modern Industrial Press,* v. 10, Dec. 1948, p. 18.

Operating presses by means of a rack-and-pinion; toggle drawing presses.

19A-4. Presses Produce Variety of Products at Buyken Machine. Howard E. Jackson. *Modern Industrial Press,* v. 10, Dec. 1948, p. 36, 38, 40.

Production of simple and complicated stampings of all kinds, and from the very small to the large.

19A-5. Modern Airplane Sub-Assembly Methods at Air Metals, Inc. *Modern Industrial Press,* v. 10, Dec. 1948, p. 44, 46, 48-49.

Miscellaneous press operations.

19A-6. The Inspection and Maintenance of Diamond Wire-Drawing Dies. *Industrial Diamond Review,* New ser., v. 8, Nov. 1948, p. 325-329.

Recommended procedures.

19A-7. Greater Capacity Presses Increase Possibilities for Stretch Forming. J. J. Sloan. *Automotive Industries,* v. 99, Dec. 15, 1948, p. 36-40, 58.

The stretch forming of various typical shapes from sheet metal. New Hufford stretch presses.

19A-8. Forging Die Design. Waldemar Naujoks. *Tool Engineer,* v. 22, Jan. 1949, p. 17-20.

Fundamental principles. Die-sinking procedures are not included unless needed to illustrate particular points.

19A-9. Contour Forming of Curved Parts. Cyril J. Bath. *Tool Engineer,* v. 22, Jan. 1949, p. 24-25.

Operation and applications of contour-forming machinery.

19A-10. Werkstoffeinsatz und optimale Leistungsausnutzung von pressdornen fur Metallrohrpressen. (Recommended Plunger Materials and Procedures for Extrusion of Metal Tubes.) H. Assmann. *Metall,* Apr. 1948, p. 108-114; May 1948, p. 153-157.

Properties of the various steels used for the above, indicating those considered desirable. Production and heat treating methods. Includes drawings of matrices and dies.

19A-11. Rolled Bars. Part II. Application of Spread Calculation to Pass Design. A. E. Lendl. *Iron and Steel,* v. 21, Dec. 1948, p. 601-604.

In Part I it was shown that the

spread of a rolled bar of nonrectangular cross-section entering a groove with non-parallel roll surfaces can be calculated with an accuracy more than sufficient for production. In Part II prints of samples from actual production are used to verify the method of calculation. Diagrams of spread factors for the layout of oval grooves. An example of the layout and design of an entire sequence of square-oval grooves.

19A-12. A New Theory of the Plastic Deformation in Wire-Drawing. Part II. (Concluded.) R. Hill and S. J. Tupper. *Wire Industry*, v. 15, Dec. 1948, p. 811-813.

Previously abstracted from *Journal of the Iron and Steel Institute*. (See item 19a-195, 1948.)

19A-13. Progressive Piercing, Punching, and Forming Dies. Charles R. Cory. *Machinery* (American), v. 55, Jan. 1949, p 152-155.

Types of progressive forging dies that have proved satisfactory for both manual and automatic feed. (To be concluded.)

19A-14. Bending Tubing and Moldings. *American Machinist*, v. 93, Jan. 13, 1949, p. 137.

Method utilizing Cerrobend, a low-melting-point Bi alloy, as temporary filler material.

19A-15. Resistance Strain Gauges for the Measurement of Roll Force, Torque, and Strip Tension. J. Rankine, W. H. Bailev, and F. P. Stanton. *Journal of the Iron and Steel Institute*, v. 160, Dec. 1948, p. 381-387.

Methods of measuring roll-separating force, spindle torque, and strip tension in the 10 x 10 in., two-high, experimental cold-rolling mill at Sheffield University.

19A-16. Laminated Plastic Bearings for Heavy Duty and Severe Service. E. P. Littlefield. *Product Engineering*, v. 20, Jan. 1949, p. 111-115.

Applications include roll-neck bearings for metal-rolling mills, and other heavy-duty uses.

19B—Ferrous

19B-1. Gas Applied to Modern Steel Forging. Charles C. Eeles. *Industrial Gas*, v. 27, Dec. 1948, p. 11-13, 25-27.

Equipment and procedures.

19B-2. Western Cold Rolled Steel. Ralph G. Paul. *Western Machinery and Steel World*, v. 39, Dec. 1948, p. 74-77, 96-97, 110.

New cold-reduction mill of Columbia Steel Co., Pittsburg, Calif.

19B-3. The Manufacture of Wrought Steel Wheels. W. A. Ashton and R. N. Merk. *Iron and Steel Engineer*, v. 25, Dec. 1948, p. 37-47; discussion, p. 48.

Developments and practices in the manufacture of wrought steel wheels and forged circular sections for transportation equipment.

19B-4. Carnegie-Illinois Modernizes Sheet Facilities at the Irvin Works. *Iron and Steel Engineer*, v. 25, Dec. 1948, p. 102-105.

19B-5. Pre-Forming in Forging Operations. *Machinery* (London), v. 73, Dec. 9, 1948, p. 805-806.

New forging technique known as "Maxirolling," developed in the U. S. Reduced scrap loss, increased die life, and higher production rates are advantages claimed.

19B-6. Fabricating Motor Truck Bodies. *Sheet Metal Worker*, v. 39, Dec. 1948, p. 33-34, 37.

Sheet-metal press and shear operations; welding operations.

19B-7. Air Cylinders and Group Punching Save Time. *Sheet Metal Worker*, v. 39, Dec. 1948, p. 48.

Use of above in punching numerous openings of several sizes, shapes, and spacings, in 18 gage, cold-rolled steel fluorescent lighting-fixture blanks.

19B-8. Unusual Fabrication Procedures Employed at Servel, Inc. Gerald E. Stedman. *Modern Industrial Press*, v. 10, Dec. 1948, p. 20, 24, 26.

Press operations in manufacture of gas refrigerators.

19B-9. Use of Presses in Fabrication of Radio Loudspeakers. Walter Rudolph. *Modern Industrial Press*, v. 10, Dec. 1948, p. 30, 32, 34, 42.

Procedures at Rola Co., Cleveland.

19B-10. Hot Drawing Steel Wire; Some Points of Interest. *Wire Industry*, v. 15, Dec. 1948, p. 817.

19B-11. Forging Die Design. The Bender. Part II. John Mueller. *Steel Processing*, v. 34, Dec. 1948, p. 641-643, 648.

The forging of parts which cannot be obtained directly from one set of hammer dies.

19B-12. Hot Drawing of HSS Drill Rod. L. V. Klaybor. *Tool & Die Journal*, v. 14, Jan. 1949, p. 46-49.

Process developed by Allegheny Ludlum Steel Corp. Curves show effects of repeated annealing on hardenability of cold-drawn 18-4-1 high speed steel rod, the higher hardness attained by hot drawn rod, and torque-twist curves for hot and cold drawn rods.

19B-13. Cold Finished Bars. H. M. Smith. *American Iron and Steel Institute*, 1948, 7 pages.

History, the dies required, production of quality surfaces, production of improved machinability, and production of irregular sections.

19B-14. Steel Wire. Francis Eickleman. *American Iron and Steel Institute*, 1948, 7 pages.

History, manufacture, terminology, classification, and heat treatments.

19B-15. Merchant Wire Products. H. A. Caldwell and C. L. McGowan. *American Iron and Steel Institute,* 1948, 8 pages.

History of the manufacture of steel and iron wire. A few of the wire products which are important from a tonnage standpoint.

19B-16. Flat Rolled Steel on the Pacific Coast. O. L. Pringle. *American Iron and Steel Institute,* 1948, 11 pages.

Various installations, their capacities and outputs.

19B-17. Producing Western Steel. Part II. Steel Rolling. *Victor Weld,* Dec. 1948, p. 4-6.

How steel is made in the West. Equipment and procedures at Bethlehem-Pacific's South San Francisco and Seattle plants. (To be continued.)

19B-18. Hot Drawing High Speed Drill Rod. L. V. Klaybor. *Steel Horizons,* v. 11, no. 1, [1949], p. 16-18.

See abstract from *Tool & Die Journal,* item 19B-12.

19B-19. Re-Engineered Tooling Simplifies Tube Bending Problems. Gerald E. Stedman. *Production Engineering & Management,* v. 23, Jan. 1949, p. 49-52.

How automatic special purpose machines are boosting output of bent steel tubing for refrigerators.

19C—Nonferrous

19C-1. Precision Dies Draw Brass Lock Parts. Harold E. Nagle. *American Machinist,* v. 92, Dec. 30, 1948, p. 74-77.

19C-2. Manufacturing Gun-Shot From Wire; A New Italian Process. *Wire Industry,* v. 15, Dec. 1948, p. 809.

Advantages over the shot-tower method. The new machine, using wire obtained from lead bars or scrap, produces in large quantities, at high speed, and without waste, any size of shot, exactly spherical in shape and with perfect polish and consistent hardness. Also permits the use of special alloys of lead.

19D—Light Metals

19D-1. A Review of Spinning Light Metals. Benjamin Melnitsky. *Light Metal Age,* v. 6, Dec. 1948, p. 8-11.

19D-2. Production of an Aluminum Cabinet. G. W. Birdsall. *Light Metal Age,* v. 6, Dec. 1948, p. 20-21.

Forming operations.

19D-3. Presses at Benson Plant Set Pace for 1,000 Barrel-a-Day Output. P. D. Aird. *Modern Industrial Press,* v. 10, Dec. 1948, p. 13-14, 16.

Production of aluminum barrels. Includes welding and inspection procedures.

19D-4. Canada's New Aluminum Sheet and Foil Mill. *Modern Metals,* v. 4, Dec. 1948, p. 29-31.

Various operations in producing sheet and foil from billet rolling to packaging.

19D-5. Spinning Large Aluminum Air Diffuser Cones. *Machinery* (American), v. 55, Jan. 1949, p. 168-169.

A picture story.

19D-6. Analyzing the Effects of Stretch-Wrap Forming of Sheet-Metal Parts. W. T. Kluge. *Machinery* (American), v. 55, Jan. 1949, p. 184-187.

System developed for charting the amount and location of elongation that occurs in stretch-wrap forming of sheet aluminum. Data can be used in determining the exact pressure required for subsequent work.

19D-7. Uber den Einfluss einer Kaltverformung auf die Ruckbildung der Kaltaushärtung von Duralumin. (The Effect of Cold-Working on the Reappearance of Room-Temperature Age Hardening of Duralumin.) Karl-Ludwig Dreyer. *Metallforschung,* v. 2, Dec. 1947, p. 362-364.

Experimental data in which the aging process was extended to 5 years.

19D-8. Erholung, Ruckbildung und Nachhärtung bei Verfestigung durch Kaltaushärtung und Kaltbearbeitung von Aluminiumlegierungen. (Recovery, Reduction, and Improvement of the Physical Properties of Aluminum Alloys by Room-Temperature Age Hardening and Cold Working.) Friedrich-Carl Althof. *Metallforschung,* v. 2, Dec. 1947, p. 365-383.

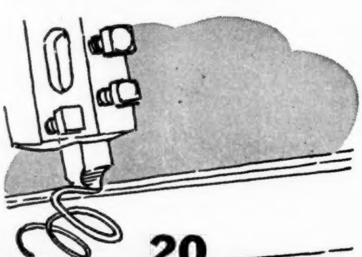
Effects of cold and hot working on the age hardening of different types of Al-Cu-Mg and Al-Zn-Mg alloys were investigated. Working may be followed by a decrease in strength even at room temperature. Kästner's and Kostron's correlation between room-temperature age hardening and cold working could not be verified. 17 ref.

19D-9. Disegno e utilizzazione dei profilati estrusi. (Designing and Utilization of Extruded Structural Parts.) *Alluminio,* v. 17, Sept.-Oct. 1948, p. 461-491.

Confined to aluminum and its alloys.

For additional annotations indexed in other sections, see:

3A-16; 3B-3-5; 3C-12; 3D-3-4; 4C-4; 7B-10; 21B-3; 21D-1



20 MACHINING and MACHINABILITY

20A—General

20A-1. Truing Form Grinding Wheels. Jack T. Welch. *Iron Age,* v. 162, Dec. 16, 1948, p. 95-98.

Use of wheel-truing rolls, their accuracy, construction, and sizing.

20A-2. Portable Jig Borer Cuts Costs. *Iron Age,* v. 162, Dec. 16, 1948, p. 102.

Tool designed to expedite precision work on airplane forgings or castings.

20A-3. Producing Multiple Parts Per Cam Cycle. *Screw Machine Engineering,* v. 10, Dec. 1948, p. 22-24.

Methods using the Browne & Sharpe automatic.

20A-4. Trepan Tools Perform Difficult Machining Operations. *Screw Machine Engineering,* v. 10, Dec. 1948, p. 26-29.

Setups employed for screw-machine production of complex part. Problems involved include: the irregular form on the inside face of the part; turning a stem extending from within the center of the part; machining an undercut on the inner boss—actually extending the stem below the face of the boss; and forming a radius on the back face of the part.

20A-5. Pitfalls to Avoid in Tooling Screw Machines. Part Eight. Noel Brindle. *Screw Machine Engineering,* v. 10, Dec. 1948, p. 31-34.

Two examples are: a caution against using the swing stop with small-diameter rod; and a discussion of the advantages of using the long-turret change shaft.

20A-6. The History and Development of the Swiss Type Automatic. *Screw Machine Engineering,* v. 10, Dec. 1948, p. 36-37.

20A-7. Practical Ideas. *American Machinist,* v. 92, Dec. 30, 1948, p. 115-116.

Includes the following: shift bar controls action of floating punches (Lowell F. Stull); reversed shaper tool doesn't dig in (S. B. Richey); special gage for measuring inside of recess (John T. Holmquist); and other miscellaneous shop hints.

20A-8. Contour Machining. H. J. Chamberland. *Science & Engineering,* v. 1, Sept. 1948, p. 48-53.

Advantages and applications.

20A-9. Fir-Tree Broaching. *Aircraft Production,* v. 10, Dec. 1948, p. 423-427.

British equipment and procedures for simultaneous machining of blade-roots and rotor disks for turbines and axial-flow compressors.

20A-10. Pryor Marking Devices for Machine Tool Components. *Machinery* (London), v. 73, Dec. 2, 1948, p. 769-772.

Hardened toolsteel relief marking dies, and methods for their use.

20A-11. An Adjustable Fly-Cutter. *Machinery* (London), v. 73, Dec. 2, 1948, p. 772.

Existing types of adjustable fly-cutters must be used with care, since the projecting tool or cutter bar is a source of danger to the operator. The design diagrammed is simple and easy to make, eliminates this danger, and permits quick and positive setting.

20A-12. End-Form Grinding Machine; An Interesting Variation of the Centreless Principle. *Machinery* (London), v. 73, Dec. 9, 1948, p. 803-804.

Machine applicable to components which require profile grinding on the ends to forms which cannot be obtained on normal centerless grinding machines, on account of wheel wear and breakdown, or the difficulty of truing attachment.

20A-13. Air-Operated Milling Fixture for Machining Parallel Surfaces. *Machinery* (London), v. 73, Dec. 9, 1948, p. 804.

20A-14. Drilling of Compound Angles. *Tool Engineer,* v. 22, Jan. 1949, p. 20.

Diagrams and calculations.

20A-15. Tools for Milling Operations. A. E. Rylander. *Tool Engineer,* v. 22, Jan. 1949, p. 37-38.

Installment No. 6 of a series describes and diagrams the above and their methods of use.

20A-16. Cutting Fluid Application Chart. *Tool Engineer,* v. 22, Jan. 1949, p. 42-43.

Five charts permit determination of proper cutting fluid on the basis of metal, cutting speed and depth, and type of operation.

20A-17. Proceedings of Leningrad Conference on Methods for Rapid Cutting of Metals. (In Russian.) A. P. Sokolovskii and V. A. P'yumberg. *Stanki i Instrument* (Machine Tools and Instruments), v. 19, Sept. 1948, p. 1-12.

Conference dealt with methods used in the U.S.S.R. and abroad.

20A-18. The Physical Meaning of Specific Cutting Pressure. (In Russian.) E. N. Maslov. *Stanki i Instrument* (Machine Tools and Instruments), v. 19, Sept. 1948, p. 12-15.

Analyzes the above concept, and its importance as a factor in determining the laws governing the process of machining.

20A-19. Concerning the Inspection of Metal Cutting Tools on the Basis of Cleanliness of Their Working Surfaces. (In Russian.) D. G. Beletskii *Stanki i Instrument* (Machine Tools and Instruments), v. 19, Sept. 1948, p. 18-22.

The influence of the tool finish on the microgeometry of the working surfaces was investigated and standards set up for their inspection.

20A-20. Vibration of Grinding Machine Tools. (In Russian.) N. V. Kolesnik. *Stanki i Instrument* (Machine Tools and Instruments), v. 19, Sept. 1948, p. 22-24.

A newly developed apparatus determines the time when the grinding wheels have to be readjusted and balanced.

20A-21. The Accuracy of Gear Hobbing Machine Tables. J. M. Newton. *Machinery* (London), v. 73, Dec. 16, 1948, p. 828-831. A condensation.

Experimental work on gear hobbers having 8 and 5-ft. diameter tables.

20A-22. A Recent Development in Automatic Lathe Control. E. P. Bullard, III. *American Society of Mechanical Engineers*, Advance Copy, Paper No. 47-A-131, 1947, 11 pages.

Three-spindle automatic lathe with "Man-Au-Trol" attachment is capable of performing turning operations in a manner similar to that of a conventional engine lathe, but with the advantage that three parts are done simultaneously and the operation is entirely automatic.

20A-23. On the Shape of Backed-Off Milling Cutters. A. Michels, S. R. De-Groot, and C. A. Ten Seldam, *Applied Scientific Research*, v. Al, No. 3, 1948, p. 219-224.

A theoretical, mathematical analysis. When the back-off curve is given, one of the three shapes of profile, wanted profile, and shaving surface can be found, provided the other two are known. A formula is derived for the case where two of the three figures are either straight or plane and the back-off curve is a logarithmic or an Archimedic spiral.

20A-24. Modern Cutting Tools and Machine Tool Design. C. Eatough. *Institution of Mechanical Engineers, Proceedings*, v. 158, Dec. 1948, p. 336-342; discussion, p. 343-351.

Cost of production is determined to a great extent by the rate of feed. Changes in machine design brought about by introduction of carbide tools and limitations of these tools. Tool life is largely determined by cratering, hence rate of crater growth is dealt with at varying speeds and feeds. Reasons for the effectiveness of the grooved type of turning tool which encourages the formation of corkscrew-type chips.

20A-25. Machining; Workpiece Handling. T. E. Lloyd. *Iron Age*, v. 163, Jan. 6, 1949, p. 206-215.

The time required for workpiece handling is said to be a bottleneck in the way of full exploitation of new cutting materials and new machine-tool designs. Attacks on this problem now underway and some of the more outstanding achievements in boosting output.

20A-26. How Should a Wheel be Dressed? *Machine and Tool Blue Book*, v. 45, Jan. 1949, p. 133-136, 138-140, 142, 144.

Recommended procedures for grinding wheels.

20A-27. Designing and Using Drill Jigs. C. W. Hinman. *Machine and Tool Blue Book*, v. 45, Jan. 1949, p. 148-156.

Designs for a box jig used for drilling and tapping simultaneously, methods of drilling steel angular sections, and the building of long, narrow box jigs.

20A-28. Computing Offset for Machining Rake Angle on Milling Cutters and Reamers. D. West. *Machinery* (American), v. 55, Jan. 1949, p. 174-175.

20A-29. Portable Jig Boring Tool Facilitates Work on Large Assemblies. *Machinery* (American), v. 55, Jan. 1949, p. 182-183.

Tool developed by Consolidated Vultee Aircraft Corp. is especially adapted for machining parts that are too large to be handled on stationary boring machines, as well as for fittings already installed.

20A-30. Reversible Jig Foot for Drilling Straight and Angular Holes. *Machinery* (American), v. 55, Jan. 1949, p. 192.

20A-31. Tool Engineering Ideas. *Machinery* (American), v. 55, Jan. 1949, p. 195-198.

"Drilling Square Stock on an Automatic Screw Machine," F. J. Watral; "Punch and Die for Forming an Unusual Shaped Piece," Robert Mawson; and "Locating Scriber for Marking Center Lines on Opposite Sides of a Shaft," H. Moore.

20A-32. Automatic Cycling Permits Rapid Turning and Boring of Sleeve Bearings. Guy Hubbard. *Steel*, v. 124, Jan. 10, 1949, p. 63-64.

Arrangements for easy loading and unloading of work, and co-ordinated operations cut idle time to minimum and allow one operator to run two lathes.

20A-33. Guide Rails Speed Jig Alignment. Ben C. Brosheer. *American Machinist*, v. 93, Jan. 13, 1949, p. 94.

20A-34. Practical Application of Surface Finish. Georg Schlesinger. *American Machinist*, v. 93, Jan. 13, 1949, p. 101-110.

Results of shop experience with tracer-type, or stylus, instruments from 1939 to 1948. Tests were made to determine surface quality as the criterion for tool sharpness in diamond turning, precision boring, grinding, honing, lapping, and gear cutting. Examples of analyses of gear-tooth profiles produced by available processes, finishing of pistons and liners for air compressors, diamond boring a bushing, and turning railway wheels.

20A-35. Practical Ideas. *American Machinist*, v. 93, Jan. 13, 1949, p. 120-124.

Includes the following: special holder clamps small parts for buffing (John K. Lukacs); die ejects slugs without bolster hole (Roger Isetts); universal die sets reduce costs (Gerhard Wenke); method for chucking gear hubs with small i.d.'s (W. J. Blankenship); tailstock to center large pipes (Thomas Gray); micrometer height gage (R. Kaden); quick-acting clamp from which part clamped can be removed directly upward (H. Buckley); triple toolbits for rapid reduction of bar stock (D. Moore and C. Johnson); peening increases life of shell reamer (W. Brunner); multiple-spindle heads finish sewing-machine parts; drilling angle iron on tilted universal table (S. B. McKay); salt-bath heat treatment fixture for rod stock (M. Karge); and other miscellaneous shop hints.

20A-36. Production Data Sheet: General Grinding Practice for Milling Cutters. *Production Engineering & Management*, v. 23, Jan. 1949, p. 65.

Covers high speed steel, cast alloy, and tungsten carbide tipped blades.

20A-37. Advantages of Double Indexing an Eight-Spindle Chucking Automatic. *Screw Machine Engineering*, v. 10, Jan. 1949, p. 22-26.

Setup for producing a specific part.

20A-38. Turret Lathe Practice. E. L. Murray. *Screw Machine Engineering*, v. 10, Jan. 1949, p. 27-31.

The various types of turret lathes and their attachments. Applications and advantages of each.

20A-39. Tables of Corrected Diameters on 10° Top-Rake Circular Tools for No. 00G Brown & Sharpe Automatics. Roy M. Spaulding. *Screw Machine Engineering*, v. 10, Jan. 1949, p. 32-34.

20A-40. Modern Machine and Engineered Tooling Produce Complex Part. *Screw Machine Engineering*, v. 10, Jan. 1949, p. 40-43.

Setups for production of bar-shaped part having cross-drilled holes, recesses, threaded end, and other complexities, on the multiple-spindle bar machine, in only 4.5 sec.

20A-41. Pitfalls to Avoid in Tooling Screw Machines. Part Nine. Noel Brindle. *Screw Machine Engineering*, v. 10, Jan. 1949, p. 49-54.

The first example is a recessing operation. The necessity for two throws and two feeds per revolution on drill lobes when the centering operation is omitted is explained. The second example, dealing with a part made from brass tubing, illustrates why it is sometimes advisable to "open up" the inside diameter with a drilling operation before reaming.

20A-42. (Book). **Drilling and Surfacing Practice. Ed. 3.** Fred H. Colvin and Frank A. Stanley. 523 pages. McGraw-Hill Book Co., 330 West 42nd St., New York 18. $5.00.

How to drill, ream, tap, plane, shape, slot, mill, and broach according to the most advanced methods. Revision incorporates all of the major developments that have taken place in this field since 1936. All information is given in a simple, clear-cut, easy-to-follow manner. (From review in *Steel*.)

20A-43. (Book). **Jigs and Fixtures.** Rev. Ed. F. H. Colvin and L. L. Haas. 410 pages. McGraw-Hill Book Co., 330 West 42nd St., New York 18. $4.50.

Practical aspects of design, construction and use of jigs and fixtures in machine shop practice are taken up by type of operation. Elements in jig and fixture design; standard parts for jigs and fixtures; welded cast iron and aluminum fixtures; various clamping and holding methods; inspection techniques.

20B—Ferrous

20B-1. Specialist in Precision. *Western Machinery and Steel World*, v. 39, Dec. 1948, p. 88-89.

Equipment and procedures of Advance Gear Machine Corp.

20B-2. 4400-Pound Casting Machined on Band Saw. *Western Machinery and Steel World*, v. 39, Dec. 1948, p. 93.

Two connecting rods were involved and the job consisted of removal of a large section of metal from the ends of the rods. In some places, the metal was 7 in. thick, the cut 22 in. long.

20B-3. Production of Carding Engines. *Machinery* (London), v. 73, Dec. 9, 1948, p. 791-799.

Methods used by a British firm for production of machine for the cotton-spinning industry.

20B-4. Machining of Heat Resistant Steels. (In Russian.) N. N. Zorev. *Stanki i Instrument* (Machine Tools and Instruments), v. 19, Sept. 1948, p. 16-18.

Machinability of a steel containing 0.52% C, 13.22% Cr, 13.75% Ni, 3.78% W, 0.64% Mn, 0.4% Si, 0.02% S, and 0.016% P was investigated. Optimum conditions for lathes and milling machines, including tool shapes.

20B-5. Influence of Steel Hardness in Face-Milling. *Machinery* (American), v. 55, Jan. 1949, p. 166. Based on paper

by J. B. Armitage and A. O. Schmidt. Results of face-milling tests on seven different kinds of steels having hardnesses of about Brinell 200, 300 and 400, made to determine power consumption and tool life.

20B-6. Broach Guiding Important in Producing Square Surfaces. *Machinery* (American), v. 55, Jan. 1949, p. 190-191.
Solution of problem in the broaching of large internal involute splines of 8 diametral pitch in forged steel wheel hubs. The problem arose from the fact that the length of broach necessary resulted in deflection of the tool and made it difficult to keep the splines square with the face. Tool deflection was overcome by guiding the broach close to the workpiece.

20B-7. Punch Press Broaches Spline. D. C. Haneline. *American Machinist,* v. 93, Jan. 13, 1949, p. 116.
Above operation in manufacture of steering arms for tractors from SAE 1030-1040 steel.

20B-8. The Baldwin Locomotive Works, Eddystone, Penna. *Production Engineering & Management,* v. 23, Jan. 1949, p. 53-60.
Procedures and equipment. Emphasizes machining operations with brief mention of brazing and soldering.

20B-9. Machining Close Tolerance Parts for Hydraulic Lifts. Frank M. Scotten. *Production Engineering & Management,* v. 23, Jan. 1949, p. 61-62.

20C—Nonferrous

20C-1. Auxiliary Stock Feeding Mechanism. H. G. Abbott. *Screw Machine Engineering,* v. 10, Dec. 1948, p. 35.
Device useful as an aid in obtaining maximum production of parts made from brass on Brown & Sharpe automatics.

20C-2. Machining Sintered Carbide Rings and Tubes; Some German Experiences. P. Popendicker. *Industrial Diamond Review,* New ser., v. 8, Nov. 1948, p. 341.

20C-3. Special Bolt Head Milling Fixture. *Machinery* (London), v. 73, Dec. 9, 1948, p. 806.
A semi-cylindrical surface and two flats are milled on the heads of brass bolts at the rate of three per min., using the fixture shown and a 2-lipped end-mill.

20D—Light Metals

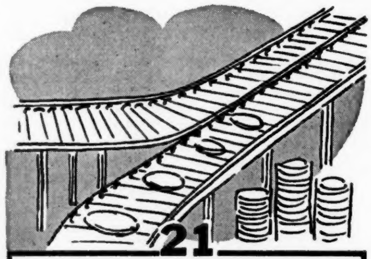
20D-1. New Tools for Sawing and Cutting Aluminum. Arthur A. Schwartz. *Light Metal Age,* v. 6, Dec. 1948, p. 12-13, 19.
New sawing machinery especially designed for the above.

20D-2. Development of a High-Speed Lathe for Machining Aluminium. *Machinery* (London), v. 73, Dec. 2, 1948, p. 763-768. A condensation.
See abstract of paper from *Machine Design,* item 20d-2, 1948.

20D-3. L'utilisation des carbures métalliques dans le tournage des alliages légers. (Use of Carbide Tools for Machining of Light Alloys.) Andre Pernollet and René Schweyckart. *Revue de l'Aluminium,* v. 25, Nov. 1948, p. 343-352.
Types of carbides which are particularly suitable for tools for machining of light alloys. Physical and chemical properties of such carbides. Saving in man-hours and cost of machining if such tools are used.

20D-4. Thin-Walled Aluminum Castings Broached to Close Tolerances. *Production Engineering & Management,* v. 23, Jan. 1949, p. 63.
Applied to aluminum typewriter frames.

For additional annotations indexed in other sections, see:
12-20



MISCELLANEOUS FABRICATION

21A—General

21A-1. Master Tooling Dock Proves Time Saver. Bill Edwards. *Western Metals,* v. 6, Dec. 1948, p. 34-35.
Originally applied in the aircraft industry, but now finding widespread application in a variety of industries. It may be described as a universal three-dimensional positioner.

21A-2. Hotpoint Mechanizes Range Production. Ben C. Brosheer. *American Machinist,* v. 92, Dec. 30, 1948, p. 67-70.
Handling equipment is synchronized with production machines for automatic operation as a unit in production of electric ranges.

21A-3. Hawker Sea Fury; Part III. Mainplane Construction; Building the Main Spars; Leading- and Trailing-Edge Sub-Assemblies; Final Assembly. S. C. Poulsen. *Aircraft Production,* v. 10, Dec. 1948, p. 413-422.
Concludes description of equipment and procedures.

21A-4. Excess Spring Stress; Points to be Watched in Spring-Making. *Wire Industry,* v. 15, Dec. 1948, p. 816.
Practical recommendations.

21A-5. Plastic Tooling Comes of Age. Lawrence Wittman. *American Society of Mechanical Engineers,* Advance Copy, Paper No. 47-A-101, 1947, 12 pages.
High-strength, low-pressure-molded, reinforced, plastic laminates have been adopted as standard, in lieu of steel, in many types of aircraft fabricating tools. Material characteristics, design considerations, and adaptability to tooling in other industries.

21A-6. Atomized Alloy Molds. Thomas A. Dickinson. *Plastics* (American), v. 8, Dec. 1948, p. 22-23, 26.
Fabrication of stainless steel and many other types of metallic molds for plastics and related materials by an atomizing and spraying process using the alloy in wire form fed through a "gun" into a gas flame or between electrical heating elements. The alloy is applied as a coating to a pattern of wood, plaster, glass, concrete, thermoplastic, or metal, the pattern being removed later.

21A-7. Some Recent Developments in the Technique of Radio Valve Manufacture. J. W. Davies, H. W. B. Gardiner, and W. H. Gomm. *Institution of Mechanical Engineers, Proceedings,* v. 158, Dec. 1948, p. 352-363; discussion, p. 364-368.
Principles of construction, materials used, and forms and types of various components, cathodes, grids, and anodes. The joining of glass and metal and notes on the machines used. Assembly processes; and tables showing the various types of joining in common use and their application in tube manufacture.

21A-8. New Production Shortcuts Aid Industry in Reducing Costs. Walter F. Toerge. *Steel,* v. 124, Jan. 3, 1949, p. 180-183.
Miscellaneous developments in casting, forging and forming, heat treating, machining, joining, surface treatment, inspection and testing, materials handling, and plant service.

21A-9. Automation: An Outstanding Method of Increasing Production. Nevin L. Bean. *Machinery* (American), v. 55, Jan. 1949, p. 145-151, 167.
System of automatic feeding, unloading and handling of work to, from, and between production machines, developed by Ford Motor Co.

21A-10. Portable 360-Cycle Electric Tools Speed up Automobile Assembly. George H. DeGroat. *Machinery* (American), v. 55, Jan. 1949, p. 156-160.
Typical uses of above for grinding bare metal, polishing, buffing, and various assembling operations, such as drilling, screw-driving, and nut-setting.

21A-11. Detroit. W. G. Patton. *Iron Age,* v. 163, Jan. 6, 1949, p. 248-257.
Some of the development work being conducted in the automobile industry in order to cut production costs.

21A-12. Plastic Tooling Proves Its Worth. Robert McLarren. *Aviation Week,* v. 50, Jan. 10, 1949, p. 20-21.
Substantial savings in aircraft production costs are effected by use of jigs and fixtures fabricated from molded laminates.

21B—Ferrous

21B-1. Equipping Industry for Continuous Production. *Western Machinery and Steel World,* v. 39, Dec. 1948, p. 84-86.
Manufacture of conveyors.

21B-2. Manufacture of Hoffmann Ball and Roller Bearings. *Engineering,* v. 166, Dec. 3, 1948, p. 535-537, 540; Dec. 10, 1948, p. 560-561, 564; Dec. 17, 1948, p. 582-583.
The methods and equipment used by the above British firm which are believed to be representative of the industry as a whole.

21B-3. Production of Sheet Steel at Irvin Works Modernized. *Blast Furnace and Steel Plant,* v. 36, Dec. 1948, p. 1465-1469.
Includes pickling lines, shearing equipment, annealing furnaces, and handling equipment.

21B-4. Gadgets. *Tool Engineer,* v. 22, Jan. 1949, p. 39-40.
"Warning for Air Pressure Failure" (as applied to air ejection of finished pieces from high-speed presses) Paul H. Winter, "Reservoir Solder Tip", A. J. Pangburn, "Internal Groove Checking," Stanley R. Welling, "Drafting Tool for Serrations," Robert E. Kidd, and "Clamp to Handle Dies," George Hull.

21B-5. Making the Standard Vanguard Body; Plant and Methods Employed at the Works of Fisher & Ludlow, Ltd. *Machinery* (London), v. 73, Dec. 16, 1948, p. 837-845.
Manufacture of British car body.

21B-6. Packaging Flat Rolled Steel. Charles E. Miller. *American Iron and Steel Institute,* 1948, 27 pages.
Typical methods.

21B-7. Packaging Coiled Strip and Wire. Harold F. Jacobsen. *American Iron and Steel Institute,* 1948, 8 pages.
Efficient material handling, bund-

ling, protection against corrosion, wrapping, boxing, palletizing, tagging, marking, and loading and bracing for transportation.

21B-8. The Manufacture of Tin Cans. *Machinery Lloyd* (Overseas Edition), v. 20, Dec. 18, 1948, p. 77-83.

Equipment and procedures.

21C—Nonferrous

21C-1. Spoons and Forks; Production Methods—Practical Plating Processes. F. R. Hill. *Metal Industry,* v. 73, Dec. 17, 1948, p. 486-488; Dec. 31, 1948, p. 526-528.

Practical details of the manufacture and plating of nickel-silver spoons and forks. Many so-called plating faults can be traced to defects in the base metal. First installment describes casting; rolling, stamping; pressing; and polishing. Second and concluding installment deals with specifications, equipment; anode materials and practice; solutions; plating procedures; filtration; bright plating; finishing; chromium plating; and speculum plating.

21D—Light Metals

21D-1. Tensioning Skin-Panels. *Aircraft Production,* v. 11, Jan. 1949, p. 9-11.

Describes and illustrates mechanical and thermal methods used by a British firm for applying tension to thin sheets of metal used in production of the smaller aircraft surfaces. Application of tension during riveting serves to eliminate defective pieces, since they fail under this tension instead of possibly later on in service.

21D-2. Report on the Bristol Brabazon. *Aircraft Production,* v. 11, Jan. 1949, p. 20-28.

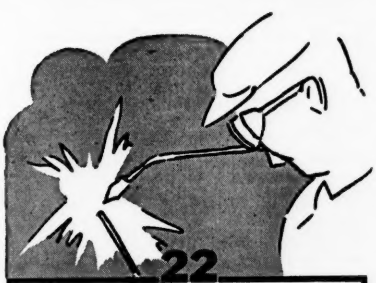
Structure of the outer wing; spar manufacture; outer-wing assembly.

21D-3. Prime-Coated for Prime Quality. *Bakelite Review,* v. 20, Jan. 1949, p. 20-22.

Production and installation of Kaiser aluminum siding prime coated with a Vinylite resin-base coating.

For additional annotations indexed in other sections, see:

19D-3



JOINING and FLAME CUTTING

22A—General

22A-1. Soldering the White Metals. *Sheet Metal Worker,* v. 39, Dec. 1948, p. 41-43.

Recommended procedures for stainless, monel, and aluminum.

22A-2. Welding Comes of Age Through Standards. Simon A. Greenberg. *Standards World,* v. 1, Winter 1948, p. 37-49.

22A-3. New Life for Spotwelding Electrodes. *Western Machinery and Steel World,* v. 39, Dec. 1948, p. 92.

New device for resurfacing spotweld electrode tips.

22A-4. Something New in Welding. *Western Machinery and Steel World,* v. 39, Dec. 1948, p. 94-95.

The "Aircomatic" process, a gas-shielded metal-arc method for welding Al and Al alloys in which a wire-form electrode is fed through a manually operated gun. Application to other metals is being investigated.

22A-5. Interaction of Elements and Their Oxides in the Welding Bath During Welding of Metals. (In Russian.) N. N. Dobrakhotov. *Avtogennoe Delo* (Welding), no. 9, Sept. 1948, p. 14-19.

The physicochemical bases of the regulation of the composition of the gas flame and the interaction of elements and their oxides during gas welding of metals. A series of formulas is proposed for calculation of such reactions. 5 ref.

22A-6. Dummy Loads for Large Industrial Welders. A. W. Brown and S. E. Johnson. *Electrical Engineering,* v. 68, Jan. 1949, p. 12-14.

A solution to the problem of objectionable voltage fluctuation in large industrial welders can be brought about by electronically interlocking each single-phase welder with a dummy load to fill in the period of no load between welds. This method also results in considerable reduction in power consumption of the ballast load.

22A-7. Characteristics of the Arc in "Heliarc" Welding. H. T. Herbst. *Electrical Engineering,* v. 68, Jan. 1949, p. 30-33.

Two distinctly different properties of an electric arc in an atmosphere of inert gas are—a cleaning action of the arc when d.c. reverse polarity is used on oxide-forming metals, and the resistance to current flow which is considerably higher when the electrode is positive. Effect on application of the Heliarc welding process.

22A-8. Idle Welders Needn't Cost Money. F. H. Varney. *Welding Engineer,* v. 34, Jan. 1949, p. 52-55.

Possibilities for saving power and cutting d.c. welding costs by means of the automatic start-stop control and arc-time totalizer.

22A-9. Spot Welding with Inert Gas. Frank J. Pilia. *Welding Engineer,* v. 34, Jan. 1949, p. 56-58, 60.

See abstract from *Industry and Welding,* item 22a-258, 1948.

22A-10. Soldering Fluxes. *Iron Age,* v. 162, Dec. 30, 1948, p. 33. Based on "Notes on Soldering," a publication of Tin Research Institute, England.

Some of the more common fluxes for soldering and their characteristics.

22A-11. Zur Entwicklung von Elektrodenwerkstoffen fur die elektrische Widerstandsschweibung. (The Development of Electrode Materials for Electrical Resistance Welding.) H. J. Seemann and M. Dadek. *Metall,* May 1948, p. 146-150.

Experimental data on various copper-alloy electrodes containing small additions of Mg, Sb, Ca, and V. The effect of annealing temperature on hardness and conductivity. 30 ref.

22A-12. How to Set up an Arc Welding Department. W. R. Pearsons. *Machine and Tool Blue Book,* v. 45, Jan. 1949, p. 109-116, 118, 120, 122, 124-128, 130.

Space required, equipment, and accessories needed. Selection of joints and electrodes, as well as production control.

22A-13. Here's How Welding Research and Development Pay Off at Ford Motor Co. *Industry and Welding,* v. 22, Jan. 1949, p. 26-31, 61, 63-64.

22A-14. Production Processes—Their Influence on Design. Part XL. Projection Welding. Roger W. Bolz. *Machine Design,* v. 21, Jan. 1949, p. 121-126.

Various types of projection-welding machines and their applications; recommended typical design components.

22A-15. Research and Development in the U. S. A. and Canada. H. G. Taylor. *Welding,* v. 16, Dec. 1948, p. 504-510.

A British visitor gives his impressions of some of the most important developments in welding science.

22A-16. Current Trends in Good Brazing Practice. Ralph Melaney, J. H. Doak, and Stanton T. Olinger. *Steel,* v. 124, Jan. 10, 1949, p. 56-59, 90-91.

Processes for joining similar and dissimilar metals with Cu, Cu alloys, and Ag alloys with emphasis on alloys, methods of application, preparation of joints, heating practice, flux removal, and cleaning.

22A-17. Gas-Shielded Metal-Arc Welding With Continuous Filler Metal Feed. Jesse S. Sohn and A. N. Kugler. *Machinery* (American), v. 55, Jan. 1949, p. 176-179. A condensation.

Previously listed from *Welding Journal.* (See item 22a-244, 1948.)

22A-18. What Not to Do When Resistance Welding. R. T. Gillette. *American Machinist,* v. 93, Jan. 13, 1949, p. 85-89.

Typical poor practices and companion recommended methods.

22A-19. Inert Gas-Shielded-Arc Spot Welding. F. J. Pilia. *Welding Journal,* v. 28, Jan. 1949, p. 5-11.

See abstract from *Industry and Welding,* item 22a-258, 1948.

22A-20. Adams Lecture: The Metallurgy of Covered Electrode Weld Metal. G. E. Claussen. *Welding Journal,* v. 28, Jan. 1949, p. 12-24.

Further advances in arc welding can be made on the basis of comprehensive studies of slags, their functions, and control.

22A-21. Welding in Steel Mill Maintenance. L. P. Elly. *Welding Journal,* v. 28, Jan. 1949, p. 38-45.

22A-22. Hard Facing With Inert-Gas-Arc Welding. K. H. Koopman. *Welding Journal,* v. 28, Jan. 1949, p. 46-52.

An investigation of inert-gas-shielded-arc welding procedures for hard facing mild steel, copper and Cu-base alloys, and stainless steel. The surfacing of mild and stainless steels with metals other than hard-facing alloys.

22A-23. Designing for Welding. Part 1. Wallace A. Stanley. *Welding Journal,* v. 28, Jan. 1949, p. 63-64.

Diagrams and text are intended to familiarize the designer with some of the basic principles called for by the various methods of resistance welding. Essentials of spot, projection, and seam welding. (To be continued.)

22A-24. Residual Stresses Due to Welding. R. Weck. *Welding Journal,* v. 28, Jan. 1949, p. 9s-14s.

Plastic deformations and residual stresses occurring in mild steel plates joined by a butt weld were measured with the Tomlinson strain gage in the immediate vicinity of the weld. The stresses were found to be near the yield point, and it is believed that stresses of this magnitude will always be found in welded steel. Welding procedure was of little influence on the magnitude of the stresses. Restriction

of angular distortion produced the highest stresses. Brittle failures which are sometimes ascribed to residual stresses appear to be due to faulty design and unsuitable material.

22A-25 (Book). **Gas Welding and Cutting: A Practical Guide to the Best Techniques.** C. G. Bainbridge. 305 pages. 1948. Published by Louis Cassier Co., Ltd. (Distributor: Iliffe & Sons, Ltd., Dorset House, Stamford St., London, S.E.1, England.) 15s. (postage, 6d.)

A textbook for the practical welder. Does not review applications, except for illustrative purposes.

22A-26. (Book). **Design for Welding.** R. S. Green, editor. Over 1000 pages. 1948. James F. Lincoln Arc Welding Foundation, Cleveland 1, Ohio. $2.00 in U. S. $2.50 elsewhere.

Composed of abstracts of 82 award papers from the recent Foundation "Design-for-Progress" Award Program. Includes cost data on the various designs. Papers are classed in the following categories: aircraft, automotive, railroad, watercraft, containers, furniture, structure, machinery, and welderies.

22A-27 (Book). **Notes on Soldering.** W. R. Lewis. 88 pagees. 1948. Tin Research Institute, Fraser Rd., Greenford, Middlesex, England. Free, on request. (Readers in U. S. may apply to Bruce Gonser, Battelle Memorial Institute, 505 King Ave., Columbus 1, Ohio.)

The title "Notes" hardly fits a 90-page book describing a metallurgical operation performed with indifferent success by millions of amateurs. As a matter of fact, soft soldering with tin-base alloys is used in a surprising number of engineering applications, some highly mechanized. For example, the manufacture of tin cans—a hand operation in grandpa's day. Consequently much study has been given to all details of the process, and the known facts are well summarized in this publication. (E.E.T.)

22B—Ferrous

22B-1. Welding for Porcelain Enameling. L. K. Stringham. *Iron Age,* v. 162, Dec. 16, 1948, p. 90-94.

How the need for annealing and stress relieving weldments prior to firing porcelain-enameled products has been eliminated by use of the inorganic lime-ferritic electrode for open arc welding and submerged melt welding. Bubbles caused by hydrogen absorption can be eliminated through proper use of these welding media. Procedure, design, material, preparation, and welding methods.

22B-2. Repairing Leaks in a Fluid Cat Cracker By Arc Welding During Operation. Robert H. Darling. *Chemical Engineering,* v. 55, Dec. 1948, p. 133-134.

22B-3. Repairing Gray Iron Castings by Welding. L. Ames. *Iron Age,* v. 162, Dec. 23, 1948, p. 46-51.

Methods and applications.

22B-4. Submerged Melt Welding in Steel Mills. E. D. Morris. *Iron and Steel Engineer,* v. 25, Dec. 1948, p. 85-88.

Advantages and applications.

22B-5. Submerged Melt Welding; Structural Steel Sections. J. M. Tippett. *Steel,* v. 123, Dec. 27, 1948, p. 58-60, 91.

22B-6. Carrousel Assembles & Welds Large Dispenser Drums. *American Machinist,* v. 92, Dec. 30, 1948, p. 80-82.

Setup includes power and gravity conveying, plus an automatic transfer mechanism.

22B-7. The Application of Arc Welding to Agricultural Machinery Repairs. A. W. Williams. *Welder,* v. 17, July-Sept. 1948, p. 50-51.

22B-8. Repair to a Large Cast Iron Pinion Wheel. *Welder,* v. 17, July-Sept. 1948, p. 52-53.

22B-9. Repair of Battle Damage to Armoured Fighting Vehicles. G. W. G. Harmer. *Welder,* v. 17, July-Sept. 1948, p. 54-55.

22B-10. Electric Arc Welding on the French National Railways. R. Biais. *Welder,* v. 17, July-Sept. 1948, p. 56-63.

22B-11. Welded Fabrication in the Electrical Motor Industry. W. H. Y. Masters. *Welder,* v. 17, July-Sept. 1948, p. 64-67.

22B-12. A Welded Jig for Aircraft Components. A. C. Hart. *Welder,* v. 17, July-Sept. 1948, p. 69-70.

22B-13. Welded Shells for Blast Furnaces. (In Russian.) B. L. Sheinkin and V. L. Tsegel'skii. *Avtogennoe Delo* (Welding), no. 9, Sept. 1948, p. 1-5.

Structural and welding details.

22B-14. Deformation of the Shells of Blast Furnaces During Welding. (In Russian.) V. I. Mel'nik and R. G. Shneiderov. *Avtogennoe Delo* (Welding), no. 9, Sept. 1948, p. 6-9.

Apparatus used to determine the above and tabulated data on the results obtained.

22B-15. Investigation of Several Types of Electrodes for Electric Arc Welding of Type "E.Ya.1-T." Steel. (In Russian.) E. M. Lapitskaya and I. N. Gerasimenko. *Avtogennoe Delo* (Welding), no. 9, Sept. 1948, p. 12-14.

Proposes several methods to avoid the intercrystalline corrosion of high Ni-Cr steel of the 18-8 and 25-20 types when ordinary electrodes are used.

22B-16. Semi-Automatic Machine for Gas Cutting of Steel Sheet 100-300 Mm. in Thickness. (In Russian.) G. M. Kazanov and V. A. Toropov. *Avtogennoe Delo* (Welding), no. 9, Sept. 1948, p. 26-27.

Optimum conditions of operation for different thicknesses are indicated.

22B-17. Concerning Thickness of the Coatings on "UONI-13" Electrodes. (In Russian.) D. M. Levykin. *Avtogennoe Delo* (Welding), Sept. 1948, p. 28.

The influence of the thickness of the coating on the mechanical properties of welds made.

22B-18. Repairs Hydro Adjustable Blade Turbines by Welding. Joel B. Justin and Ed. T. Davis. *American Society of Mechanical Engineers,* Advance Copy, Paper No. 48-F-1, 1948, 13 pages.

Welding with stainless steel and using precast-blade stainless-clad inserts.

22B-19. Rotating Fixture Facilitates Tank Welding. *Iron Age,* v. 162, Dec. 30, 1948, p. 40.

22B-20. The Part Played by Oxygen and Nitrogen in Arc Welding. J. D. Fast. *Philips Technical Review,* v. 10, July 1948, p. 26-34.

The action of oxygen and nitrogen on iron and steel is dealt with as an introduction to a discussion of the function of the coating of welding electrodes. An estimation of the solubility of oxygen and nitrogen in liquid and solid iron; their harmful and beneficial effects in electric welding; and the role of the carbon-oxygen reaction. 19 ref.

22B-21. Trusses for Electronics Park Buildings. H. L. Waugh. *Welding Engineer,* v. 34, Jan. 1949, p. 36-39.

Steel roof trusses with welded joints used in buildings of G.E.'s new project near Syracuse.

22B-22. Hard-Facing Takes to Powder. Lawrence A. Holtgren and Richard E. Parker. *Welding Engineer,* v. 34, Jan. 1949, p. 40-43.

Use of powder sprayed through flame especially for such steels as the AISI 400 series.

22B-23. Seam Welding Speeds Transformers. Walter Rudolph. *Welding Engineer,* v. 34, Jan. 1949, p. 44-45.

Use of seam welding in production of transformers by Westinghouse.

22B-24. Stud Welding at Stove Plant. W. R. Brewer. *Welding Engineer,* v. 34, Jan. 1949, p. 49.

Use to attach lighting fixtures, wiring, and sprinkler pipe to steel floor beams.

22B-25. Big Jobs in Plant Maintenance. *Welding Engineer,* v. 34, Jan. 1949, p. 63.

Welding repair of bell support housing slide for the top of a blast furnace; gray-iron skip engine bedplate which was redesigned for welded fabrication from 1½-in. hot rolled steel plates.

22B-26. Build Tanks With Plate Buggies. Max Alth. *Welding Engineer,* v. 34, Jan. 1949, p. 64.

Device used for tank-erecting jobs in which space doesn't permit use of a crane.

22B-27. Here's How Welding Research and Development Pay Off at American Car and Foundry Co. E. A. Watson. *Industry and Welding,* v. 22, Jan. 1949, p. 40-41, 44, 46, 48.

22B-28. Motor Car Production. 2. Manufacture of the Arc Welded Austin A40 Chassis. *Welding,* v. 16, Dec. 1948, p. 511-518.

22B-29. Contact Arc Welding; Applications of a New Type of Electrode. *Welding,* v. 16, Dec. 1948, p. 519-523.

Properties and applications of electrodes developed by Philips in Holland.

22B-30. The Liege Congress; Advances in Bridge & Structural Engineering. S. M. Reisser. *Welding,* v. 16, Dec. 1948, p. 524-526.

Progress of welded design in the construction of steel structures.

22B-31. Heliarc Welding Automobile Fenders. Herbert Chase. *Iron Age,* v. 163, Jan. 13, 1949, p. 51-53.

Inert-gas-shielded-arc welding is being used to weld together two stampings for front fender of the new Oldsmobile. Filler metal is used where fitting is poor, but the bulk of the welding is with tungsten electrodes.

22B-32. Some Metallurgical Aspects of Austenitic Welds. C. T. Gayley. *Welding Journal,* v. 28, Jan. 1949, p. 24-30.

The principal characteristics considered are: tendency to crater cracking, root cracking, intergranular cracking, lamellar structure of the weld metal, directional properties, and effect of cold working and recrystallization.

22B-33. The Economies of Hardfacing. J. J. Barry and Albert Muller. *Welding Journal,* v. 28, Jan. 1949, p. 31-37.

Advantages of hard facing; problems in the correct selection of the proper hard facing rod. Design and cost figures.

22B-34. Effects of Arsenic on the Weldabilities of Steels. Harujio Sekiguchi, Seiichi Ando, Kazuo Hotta, and Yoshikazu Moriwaki. *Welding Journal,* v. 28, Jan. 1949, p. 53-54. Condensed from *Journal of the Japan Welding Society,* nos. 6-7, 1948.

Results of investigation.

22B-35. Chrome Steel in Locomotive Firebox Applications. Howard L. Miller. *Welding Journal,* v. 28, Jan. 1949, p. 55-59.

Experimental and production work in the welding of 18% Cr steel plates.

22B-36. Valve Repair. Paul C. Mingee. *Welding Journal,* v. 28, Jan. 1949, p. 60.

Unusual welding procedure fol-

lowed in reconstruction of large cast-iron valve.

22B-37. Welded Press Speeds Production of Road Grader. Harry P. Krull. *Welding Journal,* v. 28, Jan. 1949, p. 61-62.

Design and fabrication of special forming press.

22B-38. Notch Sensitivity of Welded Steel Plate. R. D. Stout and L. J. McGeady. *Welding Journal,* v. 28, Jan. 1949, p. 1s-9s.

The properties of various compositions of steel plates as affected by welding conditions and treatments. Phases considered include: origin of crack formation as affected by compositions, welding conditions, and postheating; effect of normalizing temperature on prime plate and welded plate; factors affecting ductility and fracture transition temperatures; and significance of ductility vs. mode of fracture as criteria of the transitional behavior of structural steels.

22B-39. Further Studies in Projection Welding. W. F. Hess, W. J. Childs, and R. F. Underhill, Jr. *Welding Journal,* v. 28, Jan. 1949, p. 15s-23s.

Projection welding of 0.040-in. AISI 1010, 1015, and 1020 steels was investigated. Variables of weld time, weld current, electrode force, projection size and shape, and their effect on weld formation and strength.

22B-40. Impact Tests of Pressure Vessels at —320° F. T. N. Armstrong. *Welding Journal,* v. 28, Jan. 1949, p. 34s-40s.

Results of tests of welded pressure vessels of 8½% Ni steel under shock loading at the temperature of liquid nitrogen in comparison with carbon and stainless steel vessels.

22B-41. Tensile Tests of Small-Scale Welded Joints. T. D. Tuft. *Welding Journal,* v. 28, Jan. 1949, p. 41s-48s.

The relative effectiveness of Everdur brazing and steel welding in joining thin metal sections. Helium shielding improves strength and ductility of brazed joints.

22B-42. Defects in Tube Welds Made by Flash Welding. (In Russian.) A. N. Pogromskii. *Kotloturbostroenie* (Boiler and Turbine Manufacture), July-Aug. 1948, p. 24-29.

Typical defects in flash-welded boiler tubes and basic factors causing such defects. Methods for minimizing them.

22B-43. Ship Welding and the Influence of Residual Stress. C. H. Stocks and J. W. G. Thurston. *Welding,* v. 16, Dec. 1948, p. 533-538.

A general view of stresses in welded ship structures, and an investigation carried out to determine some of the effects and causes of residual stresses. Indications as to factors causing such stresses. (To be continued.)

22B-44 (Book). **Design of Welded Steel Structures. Ed. 2.** A. R. Moon. 134 pages. 1948. Sir Isaac Pitman & Sons, Ltd., Parker St., Kingsway, London W.C.2, England. 18s.

Textbook provides in concise form the necessary practical information which enables engineers and designers of constructional steelwork to make effective use of welding process. It covers the essentials of good design, metals suitable for welding, weld forms, and welding procedures. Typical joints and structural units are worked out and hints for avoiding distortion in the finished work are given.

22C—Nonferrous

22C-1. Welding High Purity Molybdenum. Julius Heuschkel. *Iron Age,* v. 162, Dec. 16, 1948, p. 86-89.

Inert-gas-shielded arc welding, spot welding, flash welding, and percussion welding experiments.

22C-2. R-F Brazing of Radio Components. R. A. Nielson. *Electronics,* v. 22, Jan. 1949, p. 111.

Briefly described as applied to a specific example.

22C-3. The Welded Joint in Non-Ferrous Chemical Plant. W. K. B. Marshall. *Proceedings of the Chemical Engineering Group, Society of Chemical Industry,* v. 26, 1944, p. 31-40; discussion, p. 40-42.

Mechanical testing of welds; physical and metallurgical factors affecting mechanical properties and corrosion resistance of weld metal and adjacent metal. Typical nonferrous weld structures. Chemical-plant applications.

22C-4. The Welding of Lead; Applications and Techniques. G. F. Charge and R. Beynon. *Welding,* v. 16, Dec. 1948, p. 527-532.

The techniques of lead welding, including the necessary types of edge preparation and the equipment required. (To be concluded.)

22D—Light Metals

22D-1. Arc Welding of Aluminium and its Alloys. (Continued.) A. Schärer. *Light Metals,* v. 11, Dec. 1948, p. 664-671. Translated from the German. (A doctorate thesis.)

Special problems associated with the welding of alloys containing

magnesium. Mechanical properties of weld metal and photomicrographs showing structures.

22D-2. Repair Welding Light Metal Castings. A. V. Lorch. *Foundry,* v. 77, Jan. 1949, p. 74-75, 134, 137, 140, 142.

Various standard welding-repair methods for Al and Mg castings. Data on welding conditions; information on corrosion resistance of the weld metal. 11 ref.

22D-3. Aluminum Tanks Fabricated Speedily With Heliarc Process. *Sheet Metal Worker,* v. 39, Dec. 1948, p. 43.

22D-4. Cold Pressure Welding. *Machinery* (London), v. 73, Dec. 16, 1948, p. 832-834.

Process developed by General Electric Co., Ltd., particularly for application to aluminum.

22D-5. Cold Welding. *Welding Engineer,* v. 34, Jan. 1949, p. 33-35.

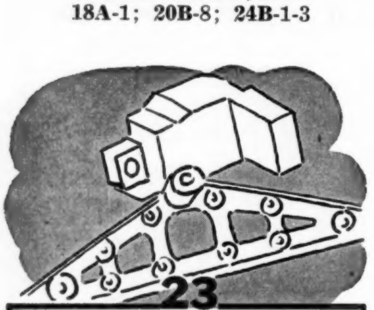
New British process in which dies are used to "weld" lapped sheets of aluminum together.

22D-6. Fabricating Aluminum Fuel Tanks With the Heliarc Process. *Welding Journal,* v. 28, Jan. 1949, p. 59-60.

22D-7 (Book). **Investigation on the Welding of High-Strength Aluminum Alloys.** (PB 92831). 63 pages. 1948. Library of Congress, Photoduplication Service, Publication Board Project, Washington. Photostat, $8.75; microfilm, $3.00.

New findings on the above are described. Three approaches to the improvement of welded joints are discussed: the development of improved filler metals; the effects of various heat treatments; and the use of unorthodox joining methods including cold pressure welding. As part of the study carried out by Battelle Memorial Institute for the Army, determinations were made of the strength properties of joints in thick high-strength aluminum alloy plates, welded by conventional processes with currently available filler materials. (From review in *Light Metal Age.*)

For additional annotations indexed in other sections, see: 18A-1; 20B-8; 24B-1-3



23A—General

23A-1. These Metals Team up to Chop Plant Costs. *Modern Industry,* v. 16, Dec. 15, 1948, p. 110-112, 114, 116, 118.

Miscellaneous applications of double and triple "sandwiches" of metal—usually known as clad metals, precoated metals, or bimetals.

23A-2. The Story of Copperweld. *Electrical Communication,* v. 25, Dec. 1948, p. 328-333.

"Copperweld" is steel wire with a copper coating poured around and welded securely to it. History of development, how it is made, and where applied.

23A-3. Some Developments in Alloys Containing Nickel. L. B. Pfeil. *Metallurgia,* v. 39, Dec. 1948, p. 81-86.

Developments in new nickel alloys and their applications. 16 ref.

23A-4 (Book). **Bearing Metals and Bearings; A List of Articles Published Between 1942 and 1946.** R. Ruedy. 54 pages. 1946. National Research Council of Canada, Ottawa. (NRC No. 1324).

Lists 332 articles. Includes brief annotations and a very simple subject index.

23B—Ferrous

23B-1. Wire Ropes; Mining and Engineering. Richard Saxton. *Canadian Mining Journal,* v. 69, Dec. 1948, p. 75-76.

Various designs; their relative serviceabilities, and recommendations for use.

23B-2. Glass-Enamelled Steel Equipment for the Chemical Industry. J. M. Pirie. *Proceedings of the Chemical Engineering Group, Society of Chemical Industry,* v. 26, 1944, p. 155-160.

Nature of the vitreous lining, design, construction, and uses.

23B-3. Selection of Materials for Plastic Molds. L. J. Morrison. *Machinery* (American), v. 55, Jan. 1949, p. 180-182. A condensation.

Properties and suitabilities of various steels for the different types of plastic-molding jobs.

23B-4. Tool Steels. D. J. Giles and F. B. Foley. *American Iron and Steel Institute,* 1949, 10 pages.

The various types, their methods of manufacture, properties, and applications.

23B-5. Recent Advances in Alloy and Special Steels. D. A. Oliver. *Metallurgia,* v. 39, Dec. 1948, p. 71-74.

Advances in low-alloy engineering constructional steels, steels for use at elevated temperatures, gas-turbine steels, toolsteels, and materials for permanent magnets. Not exhaustive, but indicative of general progress. 15 ref.

23C—Nonferrous

23C-1. Sintered Plates for Nickel-Cadmium Batteries. Arthur Fleischer. *Journal of the Electrochemical Society,* v. 94, Dec. 1948, p. 289-299.

Porous plaques are prepared by sintering nickel carbonyl powder of low apparent density. The plaques are impregnated with Ni or Cd salt solutions and the heavy metal ions precipitated in the pores of the plaque by cathodic polarization in alkali hydroxide solution. A typical set of discharge curves is shown for a 5-plate experimental cell. 20 ref.

23C-2. Magnetic Escapements for Pendulum Clocks. *Nickel Bulletin,* v. 21, Oct. 1948, p. 138-141.

Application of Ni-Fe magnet alloys.

23C-3. Erfahrungen mit Goldplatin als Werkstoff fur Laboratoriumsgeräte. (Experiences With a Gold-Platinum Alloy as a Material for Laboratory Instruments.) K. W. Frohlich. *Angewandte Chemie,* sec. B, v. 20, Mar. 1948, p. 72.

Compares Au-Pt alloy with pure platinum with respect to properties important in the laboratory. Resistance to attack by various chemical reagents at elevated temperatures.

23C-4. New Outdoor Air Switch. S. C. Killian. *Electrical Engineering,* v. 68, Jan. 1949, p. 47. Condensed from "A New Outdoor Air Switch and a New Concept of Contact Performance." (To be published in *AIEE Transactions,* v. 67, 1948.)

The blade is a one-piece hard drawn copper tube which rotates about its own axis to release contact pressure before lifting. Heavy beryllium-copper springs provide contact pressure and are independent of the hard-drawn copper shoes which carry silver inlays. This combination was chosen after a long program of contact-abrasion testing on many materials. Efficiency after oxide and sulphide film formation was determined for a series of bimetal combinations.

23C-5. How Small Is a Die Casting? *Die Casting,* v. 7, Jan. 1949, p. 26-28, 60-62.

Use of new machines and techniques makes it practical to produce die castings of almost unlimited smallness and high precision.

23C-6. Electronic Applications of Germanium. *Nature,* v. 162, Dec. 25, 1948, p. 982-983.

23C-7. Zinc-Metal Alloys and Pigments; Progress Review, 1947-1948. B. Walters. *Metallurgia,* v. 39, Dec. 1948, p. 86-90.

12 references.

23D—Light Metals

23D-1. Magnesium Dry Cells. R. C. Kirk and A. B. Fry. *Journal of the Electrochemical Society,* v. 94, Dec. 1948, p. 277-289.

Discharge characteristics are in general similar to those of zinc cells. The best cells contain a Mg-Al-Zn alloy anode.

23D-2. Aluminum-Alloy Bascule Bridge Opened in Sunderland, England—First in World. *Engineering News-Record,* v. 141, Dec. 16, 1948, p. 10.

23D-3. Aluminum in the Electric Cable Industry. *Light Metal Age,* v. 6, Dec. 1948, p. 14-19.

Properties, various specific applications, and the present state of commercial acceptance.

23D-4. Report on Magnesium and Other Developments in Platemaking—Revived and Expanded Means for Printing by Dry Offset From Relief Plate. H. E. Swayze. *Printing Equipment Engineer,* v. 77, Dec. 1948, p. 110-112.

23D-5. Hendon Dock Aluminium Bridge. *Engineer,* v. 186, Dec. 3, 1948, p. 575-578.

First aluminum alloy bascule bridge.

23D-6. Office Buildings for a New Age. *Light Metals,* v. 11, Dec. 1948, p. 642-644.

Applications of aluminum in construction of the above in Britain.

23D-7. Realized in 1948. *Light Metals,* v. 11, Dec. 1948, p. 649-654.

A pictorial record of outstanding light-alloy applications.

23D-8. The Bridge. *Light Metals,* v. 11, Dec. 1948, p. 655-663.

Design and construction of the world's first all-aluminum bridge. It is of the twin-leaf bascule type and provides for road, rail, and pedestrian traffic.

23D-9. On the London Motor Shows. *Light Metals,* v. 11, Dec. 1948, p. 689-695.

Notable instances of the use of aluminum alloys.

23D-10. Welded Aluminum Bus in Outdoor Transformer Yard of Sewaren Generating Station. D. M. Quick. *Edison Electric Institute Bulletin,* v. 16, Dec. 1948, p. 415-418, 424.

23D-11. Aluminum Valve Construction. R. McFarland. *Corrosion,* v. 5, Jan. 1949, p. 37.

Use of aluminum for all or a portion of the parts of valves for use on certain chemical processing equipment, for distilled-water service, etc.

23D-12. The U.K. Light Alloy Industry in 1948. W. C. Devereux. *Metallurgia,* v. 39, Dec. 1948, p. 91-94.

Structural applications in Britain.

For additional annotations indexed in other sections, see:
1C-3; 3A-9; 3D-1; 10B-2; 25C-2

24 DESIGN

A—General

24A-1. Floating Bearings Minimize Vibration. *Iron Age,* v. 162, Dec. 23, 1948, p. 51. Based on article by Paul Gerard in *Comptes Rendus* (France).

New type of bearing designed to eliminate vibration by allowing the shaft to rotate about its axis of inertia. The shaft makes no contact with the bearing, being supported entirely by fluid pressure. This condition can be maintained, even when the shaft is stationary, if the fluid is pressurized by an independent pump.

24A-2. A Theoretical Discussion of Pitting Failures in Gears. R. Beeching and W. Nicholls. *Institution of Mechanical Engineers, Proceedings,* v. 158, Dec. 1948, p. 317-323; discussion, p. 323-326.

Theoretical consideration of the stresses that cause surface failure of gear teeth. Methods of calculating permissible line load between contacting cylindrical surfaces for static or cyclic conditions, and probable effects of friction. Maximum case thicknesses for steel components of varying core strength when subjected to contact stresses.

24A-3. On the Plastic Bending of Circular Plates Under Uniform Transverse Loads. D. Trifan. *Quarterly of Applied Mathematics,* v. 6, Jan. 1949, p. 417-427.

A mathematical analysis applied to the specific problem of a 24S-T, aluminum alloy in a thin, circular plate built in along its entire boundary, and with uniformly distributed lateral load. Although the theories of plastic flow and plastic deformation are founded on different hypotheses, their predictions for circular plates under uniform loads and for the specific material considered are identical for all practical purposes. 13 ref.

B—Ferrous

24B-1. Welded Box Car Engineered for Mass Production and Lower Costs. J. E. Candlin, Jr., and C. G. Delo, Jr. *Steel,* v. 123, Dec. 20, 1948, p. 113-114, 116.

Design and methods of production.

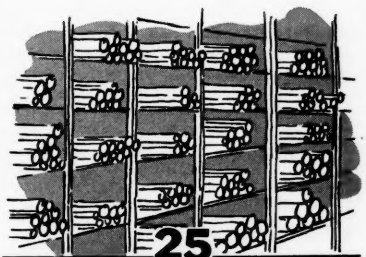
24B-2. Selecting a Material to Do a Job. D. R. Meier and J. H. Crankshaw. *Foundry,* v. 77, Jan. 1949, p. 87, 214, 216-218.

Requirements to be met in design of malleable-iron products.

24B-3. La technique de l'emploi simultané de l'acier coulé et du soudage en construction mixte. (The Technique of Simultaneous Use of Cast Steel and Welding in Compound Structures.) H. Gerbeaux. *Soudure et Techniques Connexes,* v. 2, Sept.-Oct. 1948, p. 184-200.

Technique developed by the Welding Institute of France. Importance of development of a special type of steel for such structures, design of the components, and optimum welding conditions.

For additional annotations indexed in other sections, see:
19A-8; 22A-14-23-26; 22B-44



25 MISCELLANEOUS

A—General

25A-1. Atom Swapping: Your New Way to Purify Products, Pinch Costs. *Modern Industry,* v. 16, Dec. 15, 1948, p. 44-49.

Varied uses of ion-exchange in metallurgical and nonmetallurgical applications. A simplified explanation of how the process works and discussion of choice of equipment.

25A-2. New Isotopes for Industry. *Modern Industry,* v. 16, Dec. 15, 1948, p. 121-122, 124.

More than 100 stable isotopes are now available. Applications.

25A-3. Houdaille-Hershey's Central Research Laboratory. Walter Pinner. *Automotive Industries,* v. 99, Dec. 15, 1948, p. 41, 78.

New laboratory in Detroit and some of the problems being worked on.

25A-4. Mellon Institute. E. R. Weidlein, Jr. *Research,* v. 1, Dec. 1948, p. 705-708.

Organization and recent research accomplishments.

25A-5. Radioisotopes for Industry. A. P. Schreiber. *Electronics,* v. 22, Jan. 1949, p. 90-95.

Examples of successful tagged-atom applications and suggestions for adapting the techniques to other measuring, controlling, and tracing applications. Despite widespread speculation on possible industrial uses, only 90 of the approximately 3,100 shipments from Oak Ridge to date have been for industrial research and only 20 for metallurgical research.

25A-6. Business Prospects Under the Truman New Deal. B. K. Price. *Steel,* v. 124, Jan. 3, 1949, p. 121-125.

A forecast for 1949, with emphasis on metalworking aspects.

25A-7. West Seeks Industrial Self Sufficiency. Bert D. Lynn. *Steel,* v. 124, Jan. 3, 1949, p. 148-149.

New developments in western industry, especially in metal production and fabrication.

25A-8. Western Europe's War Wounds Begin to Heal. *Steel,* v. 124, Jan. 3, 1949, p. 150-153.

Information on metal-industry outputs for 1948, and future prospects for each country.

25A-9. American Billions Bolster Europe's Economy. L. E. Browne. *Steel,* v. 124, Jan. 3, 1949, p. 154-155.

Progress of Europe resulting from ECA, and impact on U. S. economy, particularly raw materials and fabricated products.

25A-10. Industry Behind the Iron Curtain. W. J. Campbell. *Steel,* v. 124, Jan. 3, 1949, p. 156-157.

Available general and specific information. Russia's metalworking industries have climbed back to prewar production levels, but goals of fourth 5-yr. plan are difficult.

25A-11. 1949 Annual Forum on Technical Progress in Metalworking. *Steel,* v. 124, Jan. 3, 1949, p. 185-204, 206, 208, 210-211, 214-216, 219-220, 222-224, 226, 229, 232-234, 239-240, 242, 244-245, 247, 250, 252, 254, 257-258, 260, 263-264, 266, 269, 272, 277-278, 281-282, 284, 286.

Brief summaries by experts in the respective fields. A number of articles are found under each of the following headings: Metallurgy; Casting; Forging; Forming; Joining, Welding; Inspection, Testing; Equipment; Heat Treating; Surface Treatment; Lubrication; Materials Handling; Metal Production; Machining.

25A-12. Radioactive Tracers in Metallurgical Research. M. G. Fontana. *Engineering Experiment Station News* (Ohio State University), v. 20, Dec. 1948, p. 39-41.

Present and potential applications.

25A-13. The Cavendish Laboratory. Lawrence Bragg. *Journal of the Institute of Metals,* v. 75, Nov. 1948, p. 107-114.

The work of this laboratory is divided among separate groups who study nuclear physics, radio, low-temperature physics, crystallography, metal physics, and mathematical physics. Research being done by the different groups.

25A-14. List of Vested Patents Available From Office of Alien Property U. S. Department of Justice. *Office of Technical Services* (Washington), 85 pages.

Abstracts of 358 patents, predominantly German, seized from enemy nationals by the Office of Alien Property and newly released to the American public. The abstracts are classified under 18 broad headings and arranged numerically by patent number under each classification.

25A-15. Metallurgy. E. S. Kopecki. *Iron Age,* v. 163, Jan. 6, 1949, p. 216-225.

More practical approaches to oxygen use, hot-topping innovations to improve yield, cold extrusion of steel, continuous casting, high-temperature ceramics, and ceramals are a few of the 1948 developments described. Developments in titanium and radioisotopes.

25A-16. Research. T. S. Blair. *Iron Age,* v. 163, Jan. 6, 1949, p. 240-247.

Skyrocketing costs of industrial research, combined with urgent need for process and product development programs, are confronting industry, particularly small plant management, with a serious problem. Outlines a yardstick for determining the size of appropriations for research and suggests how a small plant may economically undertake such programs. Includes several case histories of the "trouble-shooting" type of research.

25A-17. Uber das Haften von monomolekularen Filmen aliphatischer Substanzen an polierten Metalloberflächen. (The Adherance of Monomolecular Films of Aliphatic Substances to Polished Metal Surfaces.) Hans Joachim Trurnit. *Angewandte Chemie,* sec. A, v. 59, Sept. 1947, p. 273-276.

Procedure and results of experiments made in an attempt to develop an "adhesiveness index."

IMPORTANT MEETINGS

For March

Feb. 28-March 4—American Society for Testing Materials. Spring Meeting and Committee Week, Edgewater Beach Hotel, Chicago. (R. J. Painter, assistant secretary, A.S.-T.M. 1916 Race St., Philadelphia.)

March 10-12—American Society of Tool Engineers. Seventeenth Annual Meeting, Hotel William Penn, Pittsburgh. (A.S.T.E., 1666 Penobscot Bldg., Detroit 26.)

March 10-12—Division of Solid State Physics, American Physical Society. Annual Meeting, Hollenden Hotel, Cleveland. (A. W. Lawson, secretary, D.S.T.P., c/o Institute for the Study of Metals, University of Chicago, Chicago 37.)

March 11-12—Second Ohio Regional Foundry Conference. Ohio State University, Columbus, Ohio. (Douglas C. Williams, general conference chairman, Department of Industrial Engineering, O.S.U., Columbus 10, Ohio.)

March 14-17—Chicago Technical Societies Council. Seventh Chicago Production Show, Stevens Hotel, Chicago. (Edward G. Bowman, general manager, 8 South Michigan Ave., Chicago 3.)

March 28-30—Society of Automotive Engineers. Transportation Meeting, Statler Hotel, Cleveland. (John A. C. Warner, secretary and general manager, S.A.E., 29 West 39th St., New York 18.)

EMPLOYMENT SERVICE BUREAU

The Employment Service Bureau is operated as a service to members of the American Society for Metals and no charge is made for advertising insertions. The "Positions Wanted" column, however, is restricted to members in good standing of the A.S.M. Ads are limited to 50 words and only one insertion of any one ad. Address answers care of A.S.M., 7301 Euclid Ave., Cleveland 3, O., unless otherwise stated.

POSITIONS OPEN

East

METALLURGICAL GRADUATE: Interested in research and development on a wide variety of steels and alloys, including those used for high temperature service. Experience in elevated temperature testing, particularly creep testing, desirable but not necessarily required. Write giving experience, education, age, marital status and salary expected. Box 2-5.

TECHNICAL PERSONNEL: To be located in New York City area. Several positions open including director of chemical research and development, chemists, associate chemists, physical chemist, physicists, associate physicists, and design engineers. Physicists with knowledge of atomic and nuclear physics preferred. Experience and education of superior type required. The Kellex Corp., 233 Broadway, New York 7, N. Y.

RESEARCH FELLOWSHIP: In metallurgy at eastern university. Postgraduate work for M.S. or Ph.D. degree. Stipend $100 per month single or $150 per month married, plus tuition, fees. Start September 1949. Applications accepted until April 1, 1949. Selection of research problem in variety of fields including welding, induction heating, corrosion, powder metallurgy, and electrometallurgy. Box 2-95.

Midwest

INDUSTRIAL SALESMEN: National organization offers permanent sales positions with salary, commission, expenses to men now living in Detroit, Cleveland, Chicago, Indianapolis, and area of Rockford, Ill. Industrial selling experience required. Knowledge of metal finishing processes desirable. Thorough training given. Must have car in good condition. Our men know of this advertisement. Write fully giving all educational and business details. Box 2-10.

POWDER METALLURGIST: Excellent opening for young engineer with experience in research or development in powder metallurgy. Prefer man with advanced college training but not essential. Should be able to initiate and execute over-all research program. Interest and experience in technical writing desirable. Metals Department, Armour Research Foundation, Chicago 16, Ill.

RESEARCH ASSISTANTS: College graduates with B.S. in metallurgy to do physical metallurgy research in a new nonferrous field at prominent university. May carry courses up to halftime load toward M.S. degree. Consideration given to inclusion of sponsored work in thesis requirements. Box 2-15.

SALES OR SERVICE ENGINEER: Calling on foundry or metal industries, who wants to take on attractive sideline selling laboratory services. Territories open in Illinois, Wisconsin, Indiana and Michigan. Box 2-20.

ASSISTANT TO CHIEF METALLURGIST: Prefer man about 30 with some industrial experience although recent metallurgical graduate with outstanding possibilities will be considered. Assist in supervision of chemistry lab., physical testing lab., sand control lab., inspection, foundry melting operations and trouble shooting on foundry and other metal process operations. Box 2-25.

AERONAUTICAL ENGINEER AND PRODUCTION ENGINEER: For Air Matériel Command. Requirements: completion of standard professional engineering curriculum leading to bachelor's degree in aeronautical or mechanical engineering or at least four years experience in aircraft production at engineering level (at least one year of such experience required). Duties consist of preparing briefs for justification of procuring of airplanes, studying specifications and recommending solution of differences arising between contractors and laboratories and air force, and initiating equipment changes. Address applications to MCACXC 32, Mr. H. W. Hoover, Air Matériel Command, Wright-Patterson Air Force Base, Dayton, Ohio.

FELLOWSHIPS AND GRADUATE ASSISTANTSHIPS: For men holding either B.S. or M.S. degrees. Fellowships with State Mining Experiment Station and various industrial organizations pay from $750 to $1800 (plus fees) a school year. Graduate assistantships in mining, metallurgy, geology, ceramics, chemistry, physics. For full information write Dr. J. D. Forrester, Missouri School of Mines & Metallurgy, Rolla, Mo.

SALES REPRESENTATIVES: For Ohio, Indiana and Illinois to sell gas atmosphere equipment including gas cyaniding equipment, tempering furnaces, and wash machines. Either manufacturer's agents or direct commissioned salesman. Would not object to men handling other noncompeting lines. Expanding organization. Box 2-30.

POSITIONS WANTED

METALLURGICAL ENGINEER: Age 36, single, M.Sc. in metallurgy at M.I.T. in 1944. Thesis in X-ray metallography. Member of Sigma Xi. Six years' experience in testing materials and heat treatment. Five years as chief engineer in a nonferrous and steel foundry. Primary interest in research. Prefers Northeast. Box 2-35.

METALLURGIST: B.S. in metallurgical engineering. Sixteen years' experience covering inspection, control laboratory, development and sales or contact metallurgy, mostly in the structural alloy steel field. Desires position as sales metallurgist or production metallurgist. Detailed experience and interview may develop better application of ability. Box 2-40.

METALLURGIST: Registered professional engineer desires responsible position in development, production or technical service. Eight years' experience in development and control including metallography, radiography, testing, inspection of aircraft gas turbine materials; casting, forging and fabricating of high-temperature application alloys. M.S. degree, age 33, married, one child. New England or metropolitan New York preferred. Box 2-45.

METALLURGICAL ENGINEER: M.S. Twenty years in ferrous and nonferrous metallurgical field. Experienced in research, development, and foundry problems in gray and malleable cast iron, steel and bronze. Desires responsible position with opportunity to organize, supervise and carry out investigational work of research or practical nature. Registered professional engineer. Box 2-50.

PROFESSOR: In charge of physical metallurgy at well-known university desires industrial or university position in physical metallurgy on West Coast. Sc D. plus five years' experience. Box 2-55.

ENGINEER: B.S. in chemical and metallurgical engineering 1942. Age 29, married. Four years' experience in process and materials engineering, quality control, production, customer service contacts. Three years' sales experience. Desires responsible position with progressive company in sales engineering or production. Box 2-60.

METALLURGICAL ENGINEER: B.S., age 26, married, logical, intelligent. Experienced in the production of nonferrous metals—chiefly copper. Can handle job with minimum of supervision. Interested in position of supervisory-executive type. Location unimportant. Box 2-65.

EXPERIENCED METALLURGIST: Age 37, B.S. degree in metallurgy. Fifteen years' experience with alloy, carbon, stainless, and toolsteel, as mill metallurgist, laboratory supervisor and customer contact metallurgist. Thoroughly versed in heat treating and steel applications. Desires position as metallurgist or salesman with steel concern. Presently employed. Box 2-70.

SALES AND TECHNICAL SERVICE MANAGER: For stainless steel and alloy steel manufacturers. Would like to purchase minor or major interest in warehouse handling stainless steels, and would devote full time to any such company. Extensive experience with all forms of stainless steel. Box 2-75.

METALLURGICAL ENGINEER: Age 25, married, M.S. 1948, major in metallurgy, minor in physical chemistry. Desires interesting position as a research metallurgist or teaching. Over two years' experience in precision casting, vacuum melting and casting at large research laboratory. Nine months' experience in small gray iron foundry. Currently graduate student and teaching assistant at large Midwest university. Box 2-80.

RESEARCH METALLURGIST: Age 27, B.S. in metallurgy in 1943. Presently in charge of corrosion investigations of metals for an aircraft company. Three years' experience in corrosion testing. Previous experience as metallographer and chemist. Desires position in corrosion field but will consider other interesting work. Box 2-85.

AUTOMOTIVE MATERIALS: Young family man with broad experience in automotive materials engineering desires change with a future. Good background in production engineering, electroplating, and heat treatment. Good appearance. Varied background would prove invaluable in purchasing, sales or engineering. Box 2-90.

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MANUFACTURERS' LITERATURE

206. Copper Alloys
Announcing the new up-to-date edition of B-34 "Copper and Copper Alloy Specifications Index". Divided in two sections with side index for easy reference to specifications, applications, and materials. American Brass Co.

207. Gas Burner
Bryant Pow-R-Semblies—packaged industrial gas burner assemblies complete with pressure blowers—fully described in bulletin 7C available on request. Bryant Heater Co.

208. Grinding
Announcing a new revised Die and Wear Parts catalog 48-WP. Full prices and data on Talide-tipped centerless grinder blades, sheet metal draw dies, wire and tube dies, drill jig bushings, etc. Metal Carbides Corp.

209. Heat Exchangers
Newly announced "Karbate" seven-tube impervious graphite shell and tube heat exchanger, series 70A. Can be converted from a single to a double pass unit by change of covers. Easily adjusted to varying rates of flow and amounts of liquid handled. National Carbon Co.

210. Heat Treating
New 36-page technical catalog-manual describing the complete line of Park "Laboratory Controlled" heat treating materials and factory aids. Park Chemical Co.

211. Lab Furnaces
Two new Leco box type furnaces are fully described in a 4-page leaflet; one designed for use in temperatures up to 2900° F., the other for temperatures up to 2600° F. Laboratory Equipment Corp.

212. Measuring Microscopes
Bulletin 161-48 contains 24 pages describing measuring microscopes for laboratory and shop. Introduction includes information on selection and use. Gaertner Scientific Corp.

213. Nickel Plating
"Practical Nickel Plating" is a new booklet on the subject of industrial nickel plating. It discusses solution compositions and operating conditions, and suggests cycles for treatment of the base metals prior to plating. International Nickel Co.

214. Nozzles, Blasting
Complete series of Super-Titan blasting nozzles with tungsten carbide liners and accessories illustrated in new two-color catalogue. Also special booklets on uses in various industries available on request. Mills Alloys, Inc.

215. Parts, Powder Metal
"Applications and Properties of Nonferrous Powder Parts" is title of educational booklet. First part deals with technical aspects of nonferrous powders; the second half is devoted to case histories. New Jersey Zinc Co.

216. Plating Rack Coating
4-page leaflet describes "Enthonite 101" a new liquid plastic plating rack coating. Material also has extensive use for coating metals to resist severely corrosive organic materials. Enthone, Inc.

217. Press, Hydraulic
Straightening, forming, broaching and assembling operations all competently and economically handled by the new hydraulic metalworking press just developed. Niagara Machine & Tool Wks.

218. Seam Welders
An 8-page bulletin No. 804 describes new line of roller head seam welders which embody three basic sizes for light, medium, and heavy duty work, also available in three types—for circular, longitudinal welding, or both. Progressive Welder Co.

219. Steel, Stainless
New Frasse stock list supplement containing many unusual items—a handy reference book. Furnished free on request. Peter A. Frasse & Co.

220. Surface Control
New 8-page bulletin gives numerous practical advantages of shop control for surface roughness and waviness. Write for "More Profits to You Through Surface Control". Physicists Research Co.

221. Tape, Insulating
A new and improved orange-colored Wrap-Rax, a synthetic resin in easy-to-use tape form for insulating plating racks. Effective as a stop-off in hard chromium and other plating solutions. Hanson-Van Winkle-Munning Co.

222. Welding
All metal joining headaches eliminated in a new 8-page illustrated bulletin containing more than 60 illustrations of how new low temperature welding alloys can save defective equipment and machinery. Also featured is the new cutting electrode, Cuttrode, for cutting metals without the use of special equipment or oxygen. Eutectic Welding Alloys Corp.

223. Welding Accessories
Attractive new 66-page catalog containing price lists and complete index of arc welding accessories just issued. Write for Catalog D. Burdett Oxygen Co.

224. Welding and Cutting
Large line of Victor gas welding and flame cutting apparatus shown in 4-color illustrations. Write for catalog form 20B. Victor Equipment Co.

READER SERVICE COUPON

Metals Review, February 1949

Circle these numbers for manufacturers' catalogs described on this page.

206	208	210	212	214	216	218	220	222	224
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Circle these numbers for information about new products described on pages 54 and 55.

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NEW PRODUCTS *in Review*

770. Blast Cleaning

New Hydro-Finish is a modified form of impact blasting with an abrasive suspended in liquid. It differs from existing blast cleaning equipment in that extremely fine mesh abrasives can be used. Precision machined parts can now be blast cleaned and held within tolerances as close as 0.0001 in.

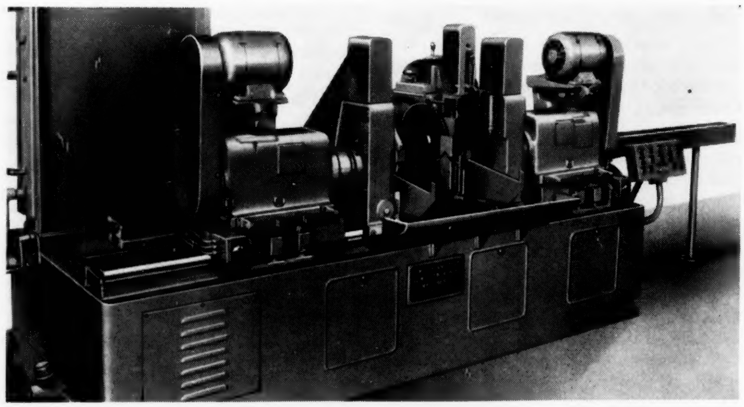
Whole new areas are therefore opened to the blast cleaning process. Because there is no breakdown of sharp edges and corners, and because of the non-directional finish obtained, the new process is achieving wide usage in the maintenance of dies and molds. Delicate instruments, wristwatch cases, watch and clock gears, cameras and fragile materials have been cleaned and polished successfully. Many companies are adopting the process for finishing cutting tools after the finish grind.

Hydro-Finish is a simple process requiring a watertight cabinet provided with a hopper tank for mixing, storing and re-collecting the suspension. A circulating pump delivers the liquid to the blasting nozzle and velocity is imparted at this point by an injection of compressed air.

Abrasive material as fine as 5000 mesh equivalent is already in common use. By varying particle size, particle hardness, air pressure, distance of gun from work, and liquid-abrasive ratio—or any combination of these factors—almost an infinite number of finishes and uses is possible.

For further information write A. L. Gardner, Pangborn Corp., Hagerstown, Md., or use coupon on page 53, circling No. 770.

771. Automatic Transfer Machine



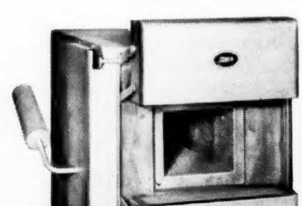
No. O-T-3 automatic transfer machine performs several simultaneous operations which formerly required a group of machines. These include circular sawing and double-end chamfering, drilling, threading, centering and hollow milling. It is said that no other single machine can chamfer tubing inside and outside on both ends. For further information write C. H. Prieffer, Motch & Merryweather Machinery Co., Penton Bldg., Cleveland, or use coupon on page 53, circling No. 771.

772. New Temco Furnace

A unique door arrangement features the new Series 1700 Temco electric furnaces. To give access to the heating chamber with minimum loss of heat, the door is divided into an upper and lower section, both controlled by a single counter-balanced lever. By moving the lever from forward to vertical the bottom section is lowered while the upper section remains in place. A further 60° movement of the lever will raise the top section and expose the full chamber. Both door sections move in a vertical plane so the hot side is always away from the operator.

Other features of the Series 1700 include an all-steel welded body, 6 in. of dual insulation, and heating elements of high quality nickel-chromium alloy. The elements are embedded in refractory plates which form the sides, top and bottom of the heating chamber.

These furnaces are supplied with



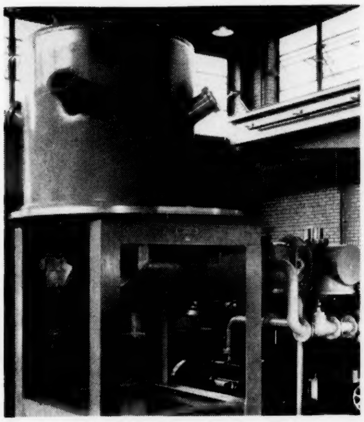
either a Temcometer temperature controlling and indicating instrument or with an electronic controlling pyrometer. They are built with a chamber opening of 8½x7½ in. and in depths of either 13½ or 18 in. Operation is on 230 volts, 50 or 60 cycles, single phase.

For further information write to C. J. Ecklund, Thermo Electric Mfg. Co., 480 W. Locust St., Dubuque, Iowa, or use coupon on page 53, circling No. 772.

773. High-Vacuum Furnace

A high-vacuum furnace for brazing large components has been designed and constructed by National Research Corp. for the research division of Collins Radio Co.

In this furnace, brazing is done at pressures less than one micron (1/760,000th of normal atmospheric



pressure). This almost total absence of air virtually eliminates oxidation during brazing.

This furnace, the largest of its type, will be used for brazing components of large power tubes.

For further information write George Carr, National Research Corp., Cambridge, Mass., or use coupon on page 53, circling No. 773.

774. Electrodes for Monel

Arcos Monend 806 electrodes produce X-ray quality welds on monel, monel clad, and steel. They eliminate the necessity of depositing a buffer layer of nickel.

Monend 806 has a spray type arc of excellent stability, which facilitates all-position welding. Free-bend specimens exhibit high elongation values, normally 50% or higher; typical weld metal yield strength is 42,500 psi. and tensile strength 75,500 psi.

For further details and samples, write Harold Snyder, Arcos Corp., 1500 South 50th St., Philadelphia 43, or use coupon on page 53, circling No. 774.

775. Special Wire Welder

An outstanding example of a special production machine was developed by pooling the knowledge of a wire manufacturer and the practical use of resistance welding.

This machine, designed and built by Sciaky Brothers, Inc., contains 12 welding pressure heads with die blocks, each arranged for welding one or more wires simultaneously. Longitudinal wires of any spacing from 1/16-in. wire spaced ¼ in. center to center, to 5/16-in. wire spaced

½-in. center to center—with a maximum spacing of 12 in. for each—may be welded with no adjustment of the electrode or the heads.

By use of the Sciaky patented Three-Phase system, uniform current distribution is obtained over all the die blocks, and a direct weld is made which permits the loading of the cross wires from above. The cross wire is loaded automatically and the longitudinal wires are indexed automatically with an adjustable spacing.

For further information write Clarence Broner, Sciaky Bros. Inc., 4915 West 67th St., Chicago 38, or use coupon on page 53, circling No. 775.

776. Cold Finished Steel

Commercial use of Electreat cold finished carbon steel bars to replace higher cost alloy steels is reported by Jones & Laughin Steel Corp.

Lundberg Screw Products Co., Lansing, Mich., is using Electreat bars, where specifications permit, to replace more expensive chromium-molybdenum alloy steel and chromium-nickel-molybdenum alloy steel in the manufacture of certain studs for automotive and farm machinery.

Use of Electreat has also enabled Lundberg to eliminate heat treating of these studs after they are machined. This means that studs of greater uniformity and smoother finish are produced at lower operating cost.

Electreat is cold finished carbon steel, heat treated by special electric induction equipment before it is sent to machine shops for manufacture into finished products. J & L is the first steel manufacturer to adopt this

Testing a Stud Made From Electreat Steel, With a Thread Gage, at Lansing Screw Products Co.

process commercially on full length cold finished bars.

The steel is available in ½ to 2-in. rounds, ½ to 1¼-in. hexagons, and ½ to 1¼-in. squares, in lengths from 10 to 24 ft.

For further information write Robert Mossman, Jones & Laughlin Steel Corp., Pittsburgh 30, or use coupon on page 53, circling No. 776.

777. Vacuum-Tube Unit

Suitable for heating nonferrous as well as ferrous materials to any desired temperature, a new Lepel vacuum-tube high-frequency heating unit can be used for hardening, soldering, brazing, or melting.

The vacuum-tube machine was developed as a companion machine to the recently announced spark-gap type heating unit. The 20-kw. output of the tube machine is the same output as that of the spark-gap unit with 30 kw. input.

The unit is housed in a sturdy, all-steel cabinet, and has heavy duty industrial type vacuum tubes, as well as grounded load coils. Flexible or rigid leads up to 8 ft. in length can be used. The machine consumes only 1 gal. of water per min. when idling, and less than 5 gal. at full load.

For further information write Henry Peterson, Lepel High Frequency Laboratories, Inc., 39 West 60th St., New York 23, or use coupon on page 53, circling No. 777.

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Continued from Front Cover

HOLDEN SALT BATH FURNACES

FOR GREATER HEAT-TREATING EFFICIENCY

FURNACE TYPE	DESCRIPTION	OPERATING TEMPERATURES	TYPE POT	HOLDEN SALT BATH GROUPS*
230	TRIPLE POT LOW COST FURNACE Fuel Fired (Gas or Oil) Preheat and Quench Units Pot sizes, 10"x18" to 16"x18"	300°-1800°F	ALLOY	B,C,D
	Electrode High Heat Unit Pot sizes, 10"x10"x18" to 14"x10"x18" Guarantee—1000-2000°F one year, 2000-2350°F six months	1300°-2350°F	CERAMIC	A,B
	(a) Preheat Pot guarantee—1000 hours Neutral Salt; 1500 hours Carburizing Salt (b) Quench Pot	300°-1300°F	PRESSED STEEL	C,D
302	ELECTRIC RESISTANCE FURNACES Pot sizes, 10"x14" to 16"x27	300°-1650°F	ALLOY OR PRESSED STEEL	B,C,D
204	IMMERSION HEATER FURNACES Single and Multiple Heaters Pot sizes, 10"x10" to 16ft.x3.5ft.x5.5ft.	300°-1100°F.	WELDED STEEL	C
401	RECIRCULATING MARQUENCHING FURNACE Calrod Heating Units, Immersion Electrodes, Atmospheric Gas Under-Fired Ring Burners	300°-700°F.	WELDED STEEL	C
207	ROLLING COVER, Five-sided Pot. Three phase only. Pot sizes, 14"x12"x10"x18" to 16"x14"x11"x36" Pot guarantee—1000° to 2000°F—1 year Pot guarantee—2000° to 2350°F—6 months	1300°-2350°F.	CERAMIC	A,B

HOLDEN SALT BATH *Recommendations*

GROUP A

Baths for treating high speed, stainless, and high-carbon high chrome steels, copper brazing and heating for forging

HIGH SPEED HIGH HEAT
17-23A, 17-25A
HARD BRITE

GROUP B

Baths for high speed preheat, and neutral hardening

HIGH SPEED PREHEAT 12-16
HARDENING 8-15
HARDENING 11-16

GROUP C

Baths for tempering, hardening, quenching, secondary hardening and finishing

TEMPERING 312
TEMPERING 310A
TEMPERING #2
BRIGHT TEMPER 612
BRIGHT TEMPER 900
OSQUENCH 300
OSQUENCH 325
HIGH SPEED QUENCH 5-11
BLACK FINISH 5-10

GROUP D

Baths for carburizing, high speed quenching, bright tempering and annealing

LIGHT CASE 50
LIGHT CASE 200
HARD CASE 250
HARD CASE 400
HARD CASE 500
HIGH SPEED QUENCH 11-15
BRIGHT TEMPER 612
BRIGHT TEMPER 900
ANNEAL 975
ANNEAL 1000

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PROVEN BY INDUSTRY
National and International

Gas or Oil Fired Furnaces
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Electrode Furnaces
Types 202—222—209—229—230—207

Electric Resistance Furnaces
Types—302—204

Hot Quenching Furnaces
Martempering
Austempering 401

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OLDEN BATH OUPS*
C,D
A,B
C,D
C,D
C
C
A,B

ed
nd